THE UNIONID MOLLUSK (MUSSEL) FAUNA OF THE VERMILION RIVER SYSTEM IN ILLINOIS

Final Report
to
Illinois Department of Conservation
Division of Forest Resources and Natural Heritage
600 North Grand Avenue West
Springfield, IL 62706

A Study by the
Illinois Natural History Survey
Liane Suloway
John J. Suloway
Wallace E. LaBerge
607 East Peabody
Champaign, IL 61820

July, 1981
INTRODUCTION

Because of the alarming rate of disappearance of natural areas in Illinois, the Illinois Department of Conservation funded a project to locate and describe natural areas in Illinois with the ultimate goal of protecting the remnants of the state's original environment. The three-year project was completed in 1978 by the University of Illinois and the Natural Land Institute and the findings were published in "Illinois Natural Areas Inventory" (White 1978). Outstanding aquatic habitats were among the several categories considered as natural areas. Recommendations for natural streams and lakes were provided by Drs. P. W. Smith and L. M. Page of the Illinois Natural History Survey. These recommendations were based largely on the fish fauna of these areas. Two of the 12 natural stream segments identified in the inventory are located in the Vermilion River basin; one is the Middle Fork from Potomac to its confluence with the Salt Fork and the other is the Vermilion River proper from the mouth of the North Fork to the state line.

A study of the mussels, substrate and water quality of the Vermilion River system was undertaken to further characterize this aquatic ecosystem, including the areas already designated as natural areas in the inventory. Mussels have long been recognized as valuable indicators of environmental changes (Ortmann 1909). They are easily influenced by the deterioration of the water quality because they are basically sedentary, have a long life span compared to other invertebrates (Stein 1971), concentrate many foreign substances (Fuller 1974) and are adversely affected by many potentially toxic substances including chlorine (Fuller 1974), nitrogen (Fuller 1974), potassium (Imlay 1971), certain heavy metals (Wurtz 1962), silt (Ellis 1936), organic enrichment (Baker 1922)
and acid mine drainage (Stansbery 1969). Channelization, dredging and the construction of impoundments also contribute to changes in mussel communities (Baker 1922, Stansbery 1970, Wilson and Clark 1912). Because of these factors, it was hypothesized that the present status and the historical changes that have occurred in mussel communities would reflect environmental conditions over a period of time and thus be a good index of the status of a stream or river as a natural area.
DESCRIPTION OF AREA

The Vermilion River originates in Ford and Iroquois Counties in east central Illinois and flows southeasterly for approximately 121 km where it confluences with the Wabash River near Cayuga, Indiana (Fig. 1). The Vermilion River has a drainage area of 1435 m² ha of which 86% is drained by its three largest tributaries - the North Fork, Middle Fork and Salt Fork. The confluence of the Salt and Middle Forks in Vermilion County forms the Vermilion River proper and the North Fork joins the river south of Danville. The headwaters of the Salt Fork consist of two branches, the Saline Ditch which flows near Champaign-Urbana and the Spoon River.

The topography of the basin is mostly flat with some gently rolling morainal ridges. The Vermilion River and its three major tributaries are low gradient streams (Brigham 1979). Before Pleistocene glaciation, the area now within the Vermilion River system was drained by the Teays River which flowed to the west (opposite the present flow). The advance and retreat of the continental glaciers beginning about 1 million years ago and ending 10,000 years ago completely erased the Teays River system. In the Vermilion basin, the unconsolidated material that presently overlies the bedrock is of glacial origin.

East central Illinois was one of the last regions to be settled in Illinois because it had no navigable streams or other means of easy transportation, little timber and the lands were poorly drained. At present, the region is principally agricultural, specializing in corn and soybean production. Coal, sand and gravel are mined in the basin.
Man-made alterations to the Vermilion River consist of widening and deepening of natural channels and the construction of lateral ditches and tile mains to facilitate drainage. The majority of this work was completed by 1920. Virtually all of the Salt Fork upstream of Sidney has been dredged. The North Fork was impounded in Danville in 1925 to form Lake Vermilion. A lowhead dam on the Salt Fork near Homer was built sometime around 1900 but washed away prior to 1958. Sewage and industrial wastewater have been discharged into the system since at least the turn of the century. The location of major wastewater treatment plants are indicated on Fig. 1.
MATERIALS AND METHODS

Mussels were collected at 28 sites during August, September and October 1980 and April of 1981 (Appendices I and II). Mussels were handpicked for three man-hours at each site. Attempts were made to collect all habitats at a site including pools, riffles and backwaters. Mussels were identified to specific level in the field and returned to the riverbed except for voucher specimens which were deposited in the Illinois Natural History Survey collection and the reference collection prepared for the Illinois Department of Conservation. Measurements of river width, depth and flow were taken and maps were sketched at each site (Appendix I).

Substrate samples were collected at 29 sites in early November 1980. Two transects each composed of five core samples were taken at each site (290 total samples). Each transect consisted of one midchannel core, two near-shore cores and two cores midway between midchannel and shore. Cores were taken with a cylindrical plexiglass tube 70 mm in inside diameter which was forced 80 mm down into the substrate (Appendix III). Laboratory analyses were completed in February 1981. Percentages of clay (.0019-.0039 mm), silt (.0039-.0625 mm), fine sand (.0625-.125 mm), medium sand (.125-.5 mm), coarse sand (.5-2.0 mm) and gravel (>2.0 mm) were measured for each core sample. Each core sample was oven-dried, processed through a splitter and a 55 ml subsample was removed. A deflocculent (25 ml of sodium hexametaphosphate) was added. The sample was agitated for six hours, after which the sample was poured into a graduated cylinder with de-ionized water to obtain a constant volume. The sample was agitated for three minutes and allowed to stand for 2 hours. Hydrometer readings were then taken (3.0 g were added to the reading to correct for temperature). Wet sieving separated the clay and most silt, sand and gravel.
After oven-drying the gravel was weighed. Sand was separated into fine, medium and coarse by dry sifting by ro-tap for 10 minutes and each category was weighed. The weight of silt was obtained by subtracting the total of clay, sand and gravel from the initial weight of the sample. The substrate at a site was characterized by averaging the values of the particle size categories for all the cores taken at the site.

Water samples were collected at 29 sites in early November 1980. The samples were taken at the surface in midstream in 250 ml Nalgene bottles and transported to the lab on ice. In the lab, pH was measured with a Beckman Altex Model 4500 pH Meter. Thirty ml were filtered through a 0.45 micron pore-size filter membrane and preserved with nitric acid and the remaining 220 ml of sample was frozen for further chemical analyses. During February 1981, water samples were analyzed for 23 inorganic chemical constituents with a Jarrell-Ash Atom Comp 975 Inductively Coupled Plasma Unit. Concentrations of nitrate, nitrite, ammonia, hardness and phosphorus were measured on a Technicon Auto Analyzer CSM-6.

Site selection was based on optimizing data available for historical comparisons and thus most of the sites sampled in 1980-81 corresponded to sites sampled in previous studies. The earliest historical information about the mussel fauna of the Vermilion River system is available from Baker (1906) who lists a few species collected prior to 1906. Extensive collections of the Salt Fork were made in 1907-1911 (Zetek 1918), 1918-1920 (Baker 1922), 1958-1962 (Matteson and Dexter 1966) and 1975 (J. Suloway 1975). Site 9 was collected 11 times between 1930 and 1939 (Van Cleave 1940) and again in 1955 (Parmalee unpubl.). Collections of the Salt, Middle and North Forks and the Vermilion River proper were made in 1956-60 by M. R. Matteson (Matteson unpubl.).
RESULTS AND DISCUSSION

Water Quality

Several studies have shown that anthropogenic activities have a profound effect on the mussel fauna. Physical alterations of the aquatic environment such as channelization (Baker 1922, Wilson and Clark 1912), construction of dams (Isom 1969) and addition of silt (Ellis 1936) have adverse effects on the mussel fauna. Alterations in water quality, such as the addition of organic waste products (Baker 1922, Starrett 1971, Wilson and Clark 1912), industrial wastes (Ortmann 1918, Williams 1969, Wilson and Clark 1912) and acid mine drainage (Williams 1969) can also be damaging to mussel populations. The absence of mussels where they once were present can be an indication of environmental perturbations.

In the Vermilion River system, 31 water quality parameters were measured at 29 sites in November 1980 (Table 1 and Fig. 2). Additional water quality data are available for previous years from the Illinois Environmental Protection Agency (IEPA 1980) and the United States Geological Survey (Grason and Healy 1979, IEPA 1980). The pH was measured immediately upon return from the field and water samples were collected for analysis of ammonia, hardness, nitrite-nitrate, nitrite, nitrate, phosphate and the presence of several elements (Fig. 2).

Measurements of pH made in this study in 1980 ranged from 7.6 to 8.6 and were within the established IEPA criteria (Illinois Pollution Control Board 1979). Two violations were found in 1978 and 1979, one on the Salt Fork at Mayview and the other on the Middle Fork at Kickapoo State Park (Table 2).

There are no IEPA criteria for hardness, which in natural waters is a function of the geological composition of the of the watershed. In the
Vermilion River system in November 1980, hardness ranged from 162-412 mg/l CaCO₃.

Nitrogenous compounds cycle through aquatic ecosystems in a complex manner, generally beginning as atmospheric nitrogen which is fixed by plants and/or organic matter and decomposing to ammonia, nitrite (NO₂⁻), and nitrate (NO₃). In unpolluted aquatic ecosystems, ammonia and ammonium occurs in relatively small quantities, usually 0.1 mg/l or less; levels greater than this are usually indicative of sewage and industrial contamination (Environmental Studies Board 1972). A level of 1.5 mg/l of total ammonia has been established as the maximum allowable by the IEPA. Ranges of 0.06-18.1 mg/l were found in November 1980 in the Vermilion River system. On the Salt Fork, the first 10 sites below the Champaign-Urbana Wastewater Treatment Facility (WTF) exceeded IEPA criteria with the first site downstream of the WTF exceeding the criteria by a factor of 12. On the Middle Fork, site 15, the first site below Paxton's WTF, also exceeded the standard. No North Fork sites exceeded the criteria, however, the first site downstream from the Danville WTF did. During 1978-79, violations of the ammonia criterium occurred on the Salt Fork at Mayview (which had numerous violations), at St. Joseph and at Oakwood and on the Vermilion River below Danville (Table 2).

Nitrite and nitrate are by-products of the decomposition of organic matter. In unpolluted freshwater systems, these two components occur in small quantities. Nitrite-nitrate levels in November 1980 ranged from 0.08 to 6.91 mg/l with nitrite ranging from 0.01 to 0.37 and nitrate from 0.07 to 6.71 mg/l. All nitrite-nitrate levels were below the IEPA maximum criteria of 10 mg/l. During 1978-1979, nitrite-nitrate levels ranged from 0.0 to 29.0 mg/l.
Phosphorus, a naturally occurring constituent of surface water, is also released in the breakdown of organic matter and high levels can indicate organic pollution. In natural water and in wastewater, phosphorus occurs almost exclusively as phosphate. Soluble ortho-phosphate levels in the Vermilion River system in November 1980 ranged from 0.01 to 7.5 mg/l. The maximum allowed by the IEPA is 0.05 mg/l. In November 1980 this level was exceeded at all Salt Fork, two Middle Fork, three North Fork and both Vermilion River sites.

Water samples taken from 29 sites in November 1980 were analyzed for 23 elements (Table 1). Several of these elements were at or below detection limits, i.e., aluminum, antimony, arsenic, cadmium, chromium, copper, lead, nickel, selenium and tin. The concentrations of elements for which IEPA standards exist did not exceed the levels allowed by the IEPA except for the level of zinc at site 15 which was measured at 1.1 mg/l (criterion is 1.0 mg/l). The concentrations of certain elements below wastewater treatment facilities were found at concentrations greater than background levels; boron, potassium, sodium and zinc were found at relatively high levels at sites 3, 15, and 22 compared to the other sites (Table 1).

The overall water quality of the Vermilion River and its tributaries varies from good to fair. The Water Quality Index, which was established by the IEPA and based on DO, fecal coliform, ammonia and total dissolved solids measurements, is used as an indication of overall water quality. Streams are rated A-good, B-average, C-fair and D-poor. The IEPA (1979) rated the Vermilion River system as follows:
Saline Branch at Mayview | C | C
Salt Fork at St. Joseph | B | C
Salt Fork at Oakwood | B | C
Middle Fork at Kickapoo St. Pk. | A | A
North Fork near Bismarck | - | C
Vermilion River below Danville | B | C

The historical record of effects of the discharge of wastes to the Salt Fork have been documented in several studies. Among the classic studies documenting the effects of organic pollution on the biota of a stream is Baker's (1922) study of the Salt Fork of the Vermilion River. In 1922, sewage from the Champaign-Urbana area (population 30,000) entered the Salt Fork practically untreated and comprised nearly half of the volume of the Salt Fork (during October) at the point of entry (Baker 1922). The portion of the Salt Fork above Champaign-Urbana was a "clean water stream, filled with aquatic life", which abruptly terminated at the junction with the wastewater effluent. The Salt Fork just below the wastewater outflow was characterized by low concentrations of dissolved oxygen, high bacteria counts, and high levels of nitrogenous substances. The stream was described as follows: "Fecal matter, in dark brown masses, as well as partly decomposed organic matter colored green by the presence of blue-green algae and the protozoan Euglena, are usually floating down the stream. . . . Bars of sand and gravel occur at irregular intervals and are covered with masses of putrescent matter forming long, alternating streaks of black and green." Baker (1922) considered the Salt Fork to be modified by
the organic pollution from Champaign-Urbana as far as Homer Park (site 9), a distance of 43 km from the source of pollution.

A wastewater treatment plant utilizing activated sludge and sprinkling filters was later built (prior to 1926) to treat wastes from the Champaign-Urbana area. Although treatment improved since Baker's study, the volume of effluent from the treatment plant increased as the Champaign-Urbana area population grew. In 1917, Baker estimated the effluent volume to be 1.5 million gallons per day. In 1975 the treatment plant discharged 13.6 ± 2.5 million gallons per day. Low concentrations of dissolved oxygen have been recorded by Larimore and Smith (1963), Brigham (1972) and J. Suloway (1975). In 1957, Matteson noted the presence of blue-green algae and no other aquatic life and a septic odor at a site 1.6 km north of Mayview, approximately 10 km below the sewage outlet. As of 1975, a large portion of the upper stretch of the Salt Fork remained unfit for most aquatic life (Suloway 1975).

Even the November 1980 water chemistry data from the Vermilion River system indicates organic pollution from wastewater treatment still alters the aquatic chemistry of the watershed. Several chemical parameters can indicate organic pollution, including depressed DO levels and elevated levels of ammonia, nitrite, nitrate and phosphate. Measurements of some of these parameters below wastewater treatment facilities indicate varying degrees of organic contamination. At site 3 (below the Champaign-Urbana WTF) ammonia and phosphate levels peak in the Salt Fork (Fig. 2). At site 15 (below Paxton WTF) ammonia, nitrite and phosphate levels peak in the Middle Fork. Several effluents discharge into the North Fork between sites 21 and 22 (including the Hoopeston WTF); levels of nitrite-nitrate and phosphate peak at site 22 for the North
Fork. Site 28, which had a high nitrite-nitrate level, is below the Danville WTF.

Substrate

In the Vermilion River system substrate composition has been altered by human activities. Channelization destabilizes the substrate and increases siltation (Harman 1974). After 1880, there was a period of rapid and extensive construction of drainage ditches and installation of drainage tiles in the Vermilion River watershed in order to drain marshy land for cultivation and eradicate diseases such as malaria and cholera. With the improved drainage and resulting increased loading of the natural channels, the Saline Ditch was cleared and straightened in order to increase flows. Between 1906 and 1912 the Saline Ditch from Urbana to St. Joseph was straightened from 31 to 23 km; in the 1930's, the Salt Fork south of St. Joseph to just north of Sidney was dredged and straightened (Figs. 3 and 4), completely destroying the bottom fauna. The dredging south of St. Joseph, which occurred after Baker's (1922) study, drastically altered several of Baker's sites (J. Suloway 1975).

Intensive agricultural practices have contributed to erosion of farm land into streams and the resulting siltation represents a serious threat to aquatic life in Champaign County (Larimore and Smith 1963). Smith (1971) considered excessive siltation to be a major factor adversely affecting fish in the state and drastically altering stream habitats.

Brigham (1972) noted that the substrate of newly dredged areas of the Salt Fork were generally a uniform sand-silt mixture. In 1975, Suloway noted that much of the Salt Fork upstream of Sidney was laden with silt. Although it is difficult to assess the changes in the silt load in the Salt Fork since Baker's
study, the pool-riffle development has certainly been replaced with a silt-laden channel between St. Joseph and Sidney since Baker's study (J. Suloway 1975). Neither Baker nor Matteson and Dexter (1966) mention siltation in their reports.

Of substrate samples collected in November 1980, sites 6 and 7 (just below Sidney) had the highest proportions of fine particle sizes (clay and silt) in the Vermilion River system (Fig. 5). The relatively rapid flow from the channelized portion above Sidney becomes slower at Sidney, depositing its fine sediment load. The substrates at the upstream sites on the Salt Fork (1-4) were composed of relatively high proportions of coarse sand compared to the eight downstream sites. Substrates composed of relatively large proportions of gravel were found in the Salt Fork at sites 8-12, on the Middle Fork at sites 18-20, and on the North Fork at sites 21, 23-25, and 27. Some of these sites, with their gravel riffles and associated flora and fauna, are among the most aesthetically pleasing in the state (Page and Evers 1977).

Quantitative historical data concerning substrate composition is not available for comparison with data collected in this study, although Baker (1922) and Matteson provide qualitative information about the substrate at their collection sites. Baker noted in 1918-1920 that the newly dredged areas of the Salt Fork (i.e., the area upstream from St. Joseph) had substrates of hard sand which had "not yet silted up to any degree". In 1980, sites in the area described by Baker had similar proportions of silt relative to most other sites in the Vermilion River system (Fig. 5), although absolute levels of silt may have increased since Baker's observations.
The substrate at site 6 was characterized by Baker as being mostly mud, an observation in agreement with the 1980 findings. However, Baker reports the substrate at site 7 as mostly sand while 1980 samples were composed of large proportions of silt comparable to those found at site 6. This may be a result of the further dredging from St. Joseph to Sidney subsequent to Baker's study. The dredging may have increased the silt-carrying capacity by further increasing the flow.

In 1980, silt was observed at all sites, with the gross estimations ranging from 5 to 40% of the substrate. Matteson noted silt at most of his sample sites although he did not observe silt at several sites which had silt as a component of the substrate in 1980 (sites 10, 11, 18, 24, 27, 28, and 29).

**Mussels**

**Present Abundance and Distribution**

In 1980, 22 species of mussels were collected in 72 man-hours of sampling at 28 sites in the Vermilion River System (Table 3). The number of individuals found at a site ranged from 0 to 116 and the number of species ranged from 0 to 14 (Table 3). Relatively high densities and/or diversities were found at sites 10 and 13 on the Salt Fork, 16 and 17 on the Middle Fork, and 24 and 25 on the North Fork (Fig. 6). Relatively diverse mussel faunas were not encountered on the Salt Fork until site 9, while the uppermost sites on the Middle and North Forks supported a comparable number of species and/or individuals. *Lasmigona complanata, Lampsilis radiata siliquoidea,* and *L. ovata ventricosa,* the three most abundant species, comprised 60% of the individuals collected in 1980.

Several species found in the Vermilion River system in 1980 are uncommon in Illinois. *Alasmidonta marginata, Cyclonaias tuberculata, Lampsilis fasciola,*
Lasmigona compressa, Obovaria subrotunda, Quadrula cylindrica, Villosa iris, and V. lienosa were represented by less than 100 specimens (of a total of over 20,000) in a state-wide survey made in the 1950s by M. R. Matteson. Of these species, Q. subrotunda and Q. cylindrica are restricted to the Ohio River basin in Illinois. Matteson found Q. cylindrica only in the Vermilion River system in Illinois, despite extensive collections of other Ohio River tributaries (i.e., the Embarras, Little Wabash, and Little Vermilion Rivers). Some experts consider Q. cylindrica to be rare and endangered in the United States (Stansbery 1971). Another species collected in 1980, L. fasciola, is largely restricted to the Vermilion River system in Illinois.

Historical Comparisons

Historical information about the mussel fauna of the Vermilion River system is available for several years. Baker (1906) listed a few species collected prior to 1906. Zetek (1918) collected on the Salt and Middle Forks from 1907-11 (Baker identified Zetek's specimens). Extensive collections of the Salt Fork were made in 1918-20 (Baker 1922), 1956-60 (Matteson unpubl.), 1958-62 (Matteson and Dexter 1966), and 1975 (J. Suloway 1975). One site on the Salt Fork was collected 11 times between 1930 and 1939 (Van Cleave 1940) and once in 1955 (Parmalee unpubl.). Collections of the Salt, Middle and North Forks and the Vermilion River proper were made in 1956-60 by Matteson (Matteson unpubl.). The number of species and/or individuals found at sites in these historical studies are presented in Fig. 6.

Thirty-four species of mussels have been reported from the Vermilion River system since the turn of the century (Table 4). A comparison of the data from 1956-60 and 1980, the two studies made of the whole system, shows a decline in
number of species in the basin from 25 to 22 with a concurrent 62% reduction in number of individuals. Nineteen of the same sites were sampled in 1980 using the same methodology and sample time as in 1956-60. The average number of individuals/site declined from 81 in 1956-60 to 31 in 1980. Fewer individuals were found at 16 of the 19 sites; no mussels were found at two sites in either study and at the remaining site, no mussels were collected in 1956-60 but one was found in 1980.

Almost all species declined in abundance since 1956-60. The three most abundant species in 1956-60, *Lampsilis radiata siliquoidea*, *L. ovata ventricosa* and *Fusconaia flava*, were reduced in abundance in 1980 to 33% of their 1956-60 levels. The absolute abundance of *Lasmigona complanata*, the fourth most abundant species in 1956-60 and the most abundant species in 1980, was approximately the same in 1980 as in 1956-60.

Since the turn the century, 31, 22, and 22 species have been reported from the Salt, Middle and North Forks, respectively (Table 4). The large number of species collected in the Salt Fork relative to the other two forks is probably the result of more extensive collection of the Salt Fork. Baker collected 25 sites on the Salt Fork, one on the Middle Fork, and none of the North Fork. The 1930-39, 1955, and 1958-62 (Matteson and Dexter 1966) studies were limited to the Salt Fork. The only comparable data for the system as a whole are from the two studies made of all three forks, i.e., the studies of 1956-60 and 1980. These two studies reveal that the North Fork supported the greatest number of species, 22 in 1956-60 and 20 in 1980 compared to the Salt Fork with 16 (1956-60) and 14 (1980) and the Middle Fork with 18 (1956-60) and 15 (1980) species (the same number of man-hours were sampled on the North and Middle Forks.
and more man-hours were spent on Salt Fork in 1980 than in 1956-60). However, 1980 abundances relative to 1956-60 levels are 80% on the Salt Fork, 55% on the Middle Fork and 26% on the North Fork. In 1980, the North Fork still maintained the greatest average abundance/site (40 individuals/site) compared to Salt Fork (29/site) or Middle Fork (26/site).

The number of species reported from the Salt Fork in 1907-11, 1918-20, 1930-39, 1955-62, 1975, and 1980 were 12, 29, 29, 24, 18, and 14, respectively. Eighteen species collected in or prior to 1975 were not found in 1980 (Table 4). The only report of Ligumia subrostrata was from 1907-11. Lampsilis teres was last found in 1918-20. Since 1930-39, three species (Lasmigona compressa, Quadrula cylindrica and Carunculina glans) have not subsequently been collected in the Salt Fork. Seven species were last collected in the Salt Fork in the 1955-62 period (Actiononaias ellipsiformis, Anodonta imbecillis, Carunculina parva, Megalonaias gigantea, Lasmigona costata, Pleurobema clava and Villosa lienosa). Five species were last collected in 1975 in the Salt Fork (Anodontoides ferussacianus, Cyclonaias tuberculata, Pleurobema cordatum, Quadrula metanevra and Uniomerus tetralasmus). Seven of these 18 species were collected in the other forks in 1980 (Table 4).

On the Middle Fork, 11 of 26 species once reported were not collected in 1980. Four species were reported from the Middle Fork only in 1907-11 (Carunculina parva, Cyclonaias tuberculata, Elliptio dilatata and Quadrula cylindrica). Lampsilis teres, Lasmigona compressa, Pleurobema clava and Quadrula metanevra haven't been collected in the Middle Fork since 1918-20 and Lampsilis fasciola, Obovaria subrotunda and Villosa lienosa were last reported in 1956-60. Six of these species were found in 1980 in the other forks.
Two species found in 1956-60 in the North Fork, *Pleurobema clava* and *Ptychobranchus fasciolaris*, were not recollected in 1980. Five species were found only in the North Fork in 1980, i.e., *Cyclonaias tuberculata*, *Lasmigona compressa*, *Quadrula cylindrica*, *Villosa iris* and *V. lienosa*.

In the Vermilion River system as a whole, 12 species collected prior to 1980 were not recollected in this study (Table 4). *Elliptio dilatata* and *Ligumia subrostrata* were collected only in 1907-11. *Lampsilis teres* and *Carunculina glans* were not collected after 1918-20 and 1932, respectively. Species last collected in the 1955-62 period are *Actinonaias ellipsiformis*, *Anodonta imbecillis*, *Carunculina parva*, *Megalonaias gigantea*, *Pleurobema clava* and *Ptychobranchus fasciolaris*. *Quadrula metanevra* and *Uniomerus tetralasmus* were last collected in 1975. Seven of the 12 species have been found only in the Salt Fork and not the other forks. At the time of their last collection these 12 species were scarce in the system. Some of the species may still exist in the system but were not collected because of their scarcity. Noteworthy among these 12 species are *Pleurobema clava* and *Ptychobranchus fasciolaris*, both of which are restricted to the Ohio River basin in Illinois. *Pleurobema clava* was collected only in the Vermilion River system in Illinois in a statewide survey of mussels conducted in the 1950s by Matteson. Experts consider this species to be rare and endangered in the United States (Stansbery 1971).

The reduction in the mussel fauna of the Vermilion River system is comparable to those found in other aquatic systems in the state. The Rock River supported 31 species in 1926, but only 21 were found in 1970 (Miller 1972). Forty species have been reported from the Kaskaskia River since the turn of the century; 24 species were collected in 1978-79. Between 1956 and 1979, the
number of species declined from 30 to 24 with a concurrent 76% reduction in abundance in the Kaskaskia River (L. Suloway, J. Suloway, E. Herricks, in prep.). In the Kankakee River 37 species have been reported since the turn of the century but only 20 were collected in 1978 (Suloway 1981).

The mussel fauna of each of the forks of the Vermilion River has undergone changes which, in some cases, reflect man's impact on the basin. In the Salt Fork mussels have not established themselves from Champaign-Urbana to below Sidney. Baker found no living mussels in the Salt Fork until 23 km downstream (between 1980 sites 4 and 5) from the Champaign-Urbana sewage effluent. In 1956-60 Matteson collected living mussels 35 km downstream from Urbana (between sites 6 & 7) and in 1980, living mussels were first collected approximately 37 km below Urbana (site 7). Baker encountered sites with six and eight species at the approximate location of site 5. In 1956-60, nine species were collected between sites 6 and 7 (no mussels were found above this site). In 1980, the first site with a comparable number of species was site 9 (7 species), or 18 km further downstream than Baker. In the Salt Fork the mussel fauna has become more restricted in distribution; the dredging between sites 4 and 6 since Baker's study has undoubtedly damaged the fauna that Baker observed in this stretch. Periodic dredging of the upper Salt Fork has taken place since Baker's study. The influence of the Champaign-Urbana wastewater treatment effluent on water quality was evident in 1980. W. U. Brigham (pers. comm.) felt that the shallow and unshaded character of the stream and the nutrient loading from agricultural runoff lead to high primary productivity in the daylight and low dissolved oxygen concentrations at night when respiration becomes dominant.
The combination of these factors may be responsible for the failure of clams to re-establish themselves in the upper Salt Fork.

On the Middle and North Forks, the influence of human activity on the mussel fauna may be evident at the sites immediately below wastewater treatment facilities. The mussel fauna at site 15 on the Middle Fork and site 22 on the North Fork were much less diverse than the sites upstream of the wastewater treatment facilities and supported the poorest mussel faunas in both of these forks. Otherwise the mussel fauna of these two forks exhibit the same trend as observed on the Salt Fork and elsewhere in the state; i.e., the general degradation of both numbers of species and individuals at nearly all sites.

On the positive side, several sites still support diverse faunas, i.e. on the Salt Fork, sites 10 and 13, on the Middle Fork sites 16 and 17, and on the North Fork sites 24 and 25. Eight species found in 1980 in the Vermilion River system could be considered rare in the state and some species are restricted to the Ohio River system and/or the Vermilion River system in Illinois. Several species once reported from the Vermilion River and its tributaries are significant to the state mussel fauna because of their rarity and limited distribution; in particular, *Pleurobema clava* and *Ptychobranchus fasciolaris.*
Acknowledgements

The principal investigators wish to express thanks to the following: J. Beckman, N. Frye, S. Kamp, S. Lowe, S. Sandberg, T. Skelly, J. Summers, M. Vargo, and M. Wetzel for their assistance in the field and S. Peratt for typing the final report. The Illinois Natural History Survey provided M. R. Matteson's unpublished data and the Illinois State Museum provided P. W. Parmalee's unpublished data.


Figure 1. Sites of 1980-81 mussel, water sample and substrate collections in the Vermilion River system in Illinois.
Figure 2. Measurements of temperature, pH, hardness, ammonia, soluble ortho-phosphate, nitrite-nitrate, nitrite and nitrate at 29 sites in the Vermilion River system in November 1980.
Figure 2. Continued.

AMMONIA

SOLUBLE ORTHO-PHOSPHATE
Figure 2. Continued.
Figure 3. The coarse of the Saline Ditch and Salt Fork in 1906 and 1970 showing the changes resulting from drainage improvements.
Figure 4. Dredging operation on the Salt Fork near St. Joseph.
Figure 5. Composition of the substrate at sites on the Vermilion River System in Illinois in November 1980.
Figure 6. Numbers of species and individual mussels at 1980-1981 sites as reported in various studies.
Table 1. Concentrations (ppm) of 23 elements in water samples from sites on Vermillion River, Illinois. Water samples were collected 5-13 November 1980. Blanks indicate levels below detection limits. NA = not available.

<table>
<thead>
<tr>
<th>Element</th>
<th>Salt Fork</th>
<th>Middle Fork</th>
<th>North Fork</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1   2   3   4</td>
<td>5   6   7   8</td>
<td>9   10  11  12  13</td>
</tr>
<tr>
<td>Aluminum</td>
<td>0.06 0.06 0.03 0.02</td>
<td>0.07 0.03 0.09 0.02</td>
<td>0.02 0.02 0.03 0.03</td>
</tr>
<tr>
<td>Antimony</td>
<td>0.47 0.38 0.61 0.47</td>
<td>0.48 0.46 0.45 0.45</td>
<td>0.65 0.44 0.44 0.44 0.42</td>
</tr>
<tr>
<td>Arsenic</td>
<td>74.9 81.1 32.9 42.4</td>
<td>41.8 42.9 44.9 45.5</td>
<td>46.6 45.8 45.1 46.7 47.4</td>
</tr>
<tr>
<td>Barium</td>
<td>0.16 0.15 0.11 0.11</td>
<td>0.12 0.16 0.10 0.12</td>
<td>0.12 0.07 0.06 0.07</td>
</tr>
<tr>
<td>Beryllium</td>
<td>0.02 0.08 0.09 0.10</td>
<td>0.12 0.16 0.06</td>
<td>0.11 0.10 0.06 0.04 0.03 NA</td>
</tr>
<tr>
<td>Boron</td>
<td>0.12 0.25 0.08 0.09</td>
<td>0.10 0.12 0.16</td>
<td>0.06 0.11 0.10 0.06 0.04 0.03 NA</td>
</tr>
<tr>
<td>Cadmium</td>
<td>34.1 37.0 19.4 23.8</td>
<td>22.7 23.5 24.6</td>
<td>24.8 25.5 25.1 24.7 25.5 454</td>
</tr>
<tr>
<td>Calcium</td>
<td>0.12 0.25 0.08 0.09</td>
<td>0.10 0.12 0.16</td>
<td>0.06 0.11 0.10 0.06 0.04 0.03 NA</td>
</tr>
<tr>
<td>Chromium</td>
<td>5.15 4.85 13.7 10.6</td>
<td>7.75 10.0 9.69</td>
<td>9.43 11.4 11.2 10.0 8.34 8.68 6.01 6.92 6.73 2.97 2.96 2.54 4.68 4.08 6.91 4.20 3.30</td>
</tr>
<tr>
<td>Copper</td>
<td>3.90 2.67 5.95 4.04</td>
<td>3.67 3.65 3.76</td>
<td>3.54 3.59 3.27 2.31 1.90 0.96 0.28 2.13 2.86 2.61 3.74 3.67 2.40 2.99 4.64 3.60 1.62</td>
</tr>
<tr>
<td>Iron</td>
<td>74.3 59.6 125.0 111.0</td>
<td>37.1 96.8 92.6</td>
<td>93.8 95.4 95.1 94.6 92.6 86.8 34.0 71.6 53.9 29.3 28.9 26.5 46.9 9.94 74.9 40.7 25.0 2</td>
</tr>
<tr>
<td>Lead</td>
<td>3.40 0.04 0.01 0.01</td>
<td>0.04 0.07 0.04</td>
<td>1.10 0.23 0.80 0.55 0.08 0.60 0.02</td>
</tr>
<tr>
<td>Magnesium</td>
<td>0.04 0.01 0.49 0.02</td>
<td>0.04 0.07 0.04</td>
<td>1.10 0.23 0.80 0.55 0.08 0.60 0.02</td>
</tr>
</tbody>
</table>
of 23 elements in water samples from sites on Vermillion River, Illinois. Water samples were collected 5-13 November 1980 and analyzed 30 January 1981. LOs below detection limits. NA = not available.

<table>
<thead>
<tr>
<th></th>
<th>Salt Fork</th>
<th>Middle Fork</th>
<th>North Fork</th>
<th>Vermillion River</th>
<th>Detection Limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>0.07 0.03 0.09</td>
<td>0.08 0.04 0.04</td>
<td>0.04 0.03</td>
<td>0.06</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>0.03 0.02 0.02</td>
<td>0.05 0.04 0.04</td>
<td>0.04 0.02</td>
<td>0.05</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>0.02 0.02 0.03</td>
<td>0.04 0.02 0.04</td>
<td>0.03 0.02</td>
<td>0.04</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>0.09 0.03 0.03</td>
<td>0.05 0.04 0.04</td>
<td>0.03 0.03</td>
<td>0.04</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>0.02 0.02 0.03</td>
<td>0.04 0.04 0.04</td>
<td>0.04 0.03</td>
<td>0.04</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>0.02 0.02 0.03</td>
<td>0.04 0.04 0.04</td>
<td>0.04 0.03</td>
<td>0.04</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>0.03 0.03 0.03</td>
<td>0.04 0.04 0.04</td>
<td>0.04 0.03</td>
<td>0.04</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>0.03 0.03 0.03</td>
<td>0.04 0.04 0.04</td>
<td>0.04 0.03</td>
<td>0.04</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>0.03 0.03 0.03</td>
<td>0.04 0.04 0.04</td>
<td>0.04 0.03</td>
<td>0.04</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>0.04 0.04 0.04</td>
<td>0.04 0.04 0.04</td>
<td>0.04 0.03</td>
<td>0.04</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>0.04 0.04 0.04</td>
<td>0.04 0.04 0.04</td>
<td>0.04 0.03</td>
<td>0.04</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>0.04 0.04 0.04</td>
<td>0.04 0.04 0.04</td>
<td>0.04 0.03</td>
<td>0.04</td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>0.04 0.04 0.04</td>
<td>0.04 0.04 0.04</td>
<td>0.04 0.03</td>
<td>0.04</td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>0.04 0.04 0.04</td>
<td>0.04 0.04 0.04</td>
<td>0.04 0.03</td>
<td>0.04</td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>0.04 0.04 0.04</td>
<td>0.04 0.04 0.04</td>
<td>0.04 0.03</td>
<td>0.04</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>0.04 0.04 0.04</td>
<td>0.04 0.04 0.04</td>
<td>0.04 0.03</td>
<td>0.04</td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>0.04 0.04 0.04</td>
<td>0.04 0.04 0.04</td>
<td>0.04 0.03</td>
<td>0.04</td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>0.04 0.04 0.04</td>
<td>0.04 0.04 0.04</td>
<td>0.04 0.03</td>
<td>0.04</td>
<td></td>
</tr>
<tr>
<td>23</td>
<td>0.04 0.04 0.04</td>
<td>0.04 0.04 0.04</td>
<td>0.04 0.03</td>
<td>0.04</td>
<td></td>
</tr>
<tr>
<td>24</td>
<td>0.04 0.04 0.04</td>
<td>0.04 0.04 0.04</td>
<td>0.04 0.03</td>
<td>0.04</td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>0.04 0.04 0.04</td>
<td>0.04 0.04 0.04</td>
<td>0.04 0.03</td>
<td>0.04</td>
<td></td>
</tr>
<tr>
<td>26</td>
<td>0.04 0.04 0.04</td>
<td>0.04 0.04 0.04</td>
<td>0.04 0.03</td>
<td>0.04</td>
<td></td>
</tr>
<tr>
<td>27</td>
<td>0.04 0.04 0.04</td>
<td>0.04 0.04 0.04</td>
<td>0.04 0.03</td>
<td>0.04</td>
<td></td>
</tr>
<tr>
<td>28</td>
<td>0.04 0.04 0.04</td>
<td>0.04 0.04 0.04</td>
<td>0.04 0.03</td>
<td>0.04</td>
<td></td>
</tr>
<tr>
<td>29</td>
<td>0.04 0.04 0.04</td>
<td>0.04 0.04 0.04</td>
<td>0.04 0.03</td>
<td>0.04</td>
<td></td>
</tr>
</tbody>
</table>
Table 2. Illinois Environmental Protection Agency water quality criteria* for certain constituents and the number of violations in 1978 and 1979.

| IEPA Criteria** | Mayview St. Joe Oakwood Middle Fork North Fork Verm. River |
|-----------------|------------------------|------------------------|------------------------|------------------------|
| **DO**          | 5.0          | 0 0 0 0 0 0 0 0 | 0 0 0 0 0 0 0 0 | 0 0 0 0 0 0 0 0 | 0 0 0 0 0 0 0 0 |
| **pH**          | 6.500 9.000  | 1/14*** 0 0 0 0 0 0 | 0 1/12 0 0 0 0 | 0 0 0 0 0 0 0 0 | 0 0 0 0 0 0 0 0 |
| **Ammonia-**    |              | 8/14 9/15 1/14 1/15 1/13 1/15 | 0 0 0 0 0 0 | 0 0 0 0 0 0 0 0 | 4/13 1/15 |
| **Ammonium**    |              |              |              |              |              |              |
| **Chloride**    | 500          | 0 0 0 0 0 0 0 0 | 0 0 0 0 0 0 0 0 | 0 0 0 0 0 0 0 0 | 0 0 0 0 0 0 0 0 |
| **Sulfate**     | 500          |              |              |              |              |              |
| **Arsenic**     | 1.0          | 0 - - 0 - 0 - | 0 - 0 - 0 - | 0 - 0 - 0 - | 0 - 0 - 0 - | 0 - 0 - 0 - | 0 - 0 - 0 - |
| **Boron**       | 1.0          | 0 - - - 0 - | 0 - 0 - 0 - | 0 - 0 - 0 - | 0 - 0 - 0 - | 0 - 0 - 0 - | 0 - 0 - 0 - |
| **Cadmium**     | 0.05         | 0 - - 0 - | 0 - 0 - 0 - | 0 - 0 - 0 - | 0 - 0 - 0 - | 0 - 0 - 0 - | 0 - 0 - 0 - |
| **Chromium**    | 1.0          | 0 - - 0 - | 0 - 0 - 0 - | 0 - 0 - 0 - | 0 - 0 - 0 - | 0 - 0 - 0 - | 0 - 0 - 0 - |
| **Copper**      | 0.02         | 0 0 0 0 0 0 1/11 0 | 0 1/15 0 0 0 0 | 0 1/15 0 0 0 0 | 0 1/15 |
| **Iron**        | 1.0          | 1/4 - - - | 1/13 3/17 | 2/12 4/15 0 - | 3/12 8/18 |
| **Lead**        | 0.0          | 0 0 0 0 0 0 0 0 | 0 0 0 0 0 0 | 0 0 0 0 0 0 | 0 0 0 0 0 0 | 0 0 0 0 0 0 |
| **Manganese**   | 1.0          | 0 0 0 0 0 0 0 0 | 0 0 0 0 0 0 | 0 0 0 0 0 0 | 0 0 0 0 0 0 | 0 0 0 0 0 0 |
| **Zinc**        | 1.0          | 0 0 0 0 0 0 0 0 | 0 0 0 0 0 0 | 0 0 0 0 0 0 | 0 0 0 0 0 0 | 0 0 0 0 0 0 |
| **Fecal**       | 200          | 4/12 1/14 | 6/12 10/14 | 6/13 5/11 | 5/12 4/10 7/9 | 5/6 2/8 | 8/11 |
| **Coliform**    |              |              |              |              |              |              |              |
| **Mercury**     | 0.0005       | 0 0 0 0 0 0 0 0 | 0 0 0 0 0 0 | 0 0 0 0 0 0 | 0 0 0 0 0 0 | 0 0 0 0 0 0 |
| **Phosphorus**  | 0.05         |              |              |              |              |              |              |

*From Illinois Pollution Control Board Rules & Regulations Chapter 3: Water Pollution (1977 with amendments through July 1, 1979).  
**All in mg/l except pH (in pH units) and fecal coliforms (FC/100ml) all represent maximum allowed except DOC (minimum allowed) and pH (range).  
***Violations expressed as number of violations/number of values.
Table 3. Numbers of live individual mussels collected in the Vermilion River system in Illinois in 1980. Stations 1, 2, 3, 5, and 12 have not yet been utilized.

<table>
<thead>
<tr>
<th>Species</th>
<th>Salt Fork</th>
<th>Middle Fork</th>
<th>North Fork</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1 2 3 4 5</td>
<td>6 7 8 9 10</td>
<td>11 12 13</td>
</tr>
<tr>
<td>Actinonaias carinata</td>
<td>1</td>
<td>3 5 1 1</td>
<td>1 1</td>
</tr>
<tr>
<td>Alasmidonta marginata</td>
<td>1</td>
<td>3 1 1 1</td>
<td>1 2</td>
</tr>
<tr>
<td>Ambelina plicata</td>
<td></td>
<td>5 1</td>
<td>1 2</td>
</tr>
<tr>
<td>Anodonta grandis grandis</td>
<td>1</td>
<td>1 5 11</td>
<td>1 2</td>
</tr>
<tr>
<td>Anodontoides ferussacianus</td>
<td></td>
<td></td>
<td>2 1</td>
</tr>
<tr>
<td>Cyclonaias tuberculata</td>
<td></td>
<td></td>
<td>4 5 15</td>
</tr>
<tr>
<td>Fusconaia flava</td>
<td>1</td>
<td>9 2 1 1 2 1</td>
<td>1 4</td>
</tr>
<tr>
<td>Lampsilis fasciola</td>
<td>1</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>L. ovata ventricosa</td>
<td>1</td>
<td>4 7 2 1 9 8</td>
<td>4 7 12 28</td>
</tr>
<tr>
<td>L. radiata siliquoides</td>
<td>1</td>
<td>9 6 11 2 6</td>
<td>3 1 3 12 8</td>
</tr>
<tr>
<td>Lasmigona complanata</td>
<td>1 10 42 2</td>
<td>15 19 16 27</td>
<td>2 3 1 4 13</td>
</tr>
<tr>
<td>L. compressa</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>L. costata</td>
<td></td>
<td></td>
<td>1 10</td>
</tr>
<tr>
<td>Obovariia subrotunda</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pleurobema cordatum</td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Quadrula cylindrica</td>
<td></td>
<td></td>
<td>5</td>
</tr>
<tr>
<td>Q. pustulosa</td>
<td>1</td>
<td>4 2</td>
<td></td>
</tr>
<tr>
<td>Q. quadrula</td>
<td>1 1 2 7 1</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Strophitus undulatus</td>
<td>1</td>
<td>1 5 1</td>
<td></td>
</tr>
<tr>
<td>Trigonia verrucosa</td>
<td>2 1 7 1</td>
<td>5 1</td>
<td></td>
</tr>
<tr>
<td>Villosa iris</td>
<td></td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>V. vienosa</td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Individuals</td>
<td>0 0 1 2 25</td>
<td>62 2 80 24</td>
<td>1 46 63</td>
</tr>
<tr>
<td>Species</td>
<td>0 0 1 2 7</td>
<td>10 1 14 4</td>
<td>1 9 10 5 5</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>5 5 6 1 6</td>
</tr>
</tbody>
</table>
Live individual mussels collected in the Vermillion River system in Illinois in 1980. Stations 1, 2, 3, 5, and 12 have not yet been sampled.

<table>
<thead>
<tr>
<th>Salt Fork</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
<th>13</th>
<th>Middle Fork</th>
<th>14</th>
<th>15</th>
<th>16</th>
<th>17</th>
<th>18</th>
<th>19</th>
<th>20</th>
<th>North Fork</th>
<th>21</th>
<th>22</th>
<th>23</th>
<th>24</th>
<th>25</th>
<th>26</th>
<th>27</th>
<th>Vermillion River</th>
<th>28</th>
<th>29</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>5</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
<td>1</td>
<td></td>
<td>7</td>
<td>6</td>
<td></td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
<td>12</td>
<td></td>
<td>19</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>3</td>
<td>1</td>
<td>27</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td></td>
<td>7</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>1</td>
<td>5</td>
<td>11</td>
<td>1</td>
<td>1</td>
<td>4</td>
<td>3</td>
<td>4</td>
<td>14</td>
<td>35</td>
<td>8</td>
<td>37</td>
<td>1</td>
<td>4</td>
<td>5</td>
<td>11</td>
<td>1</td>
<td></td>
<td>14</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>4</td>
<td>5</td>
<td>11</td>
<td>37</td>
<td>8</td>
<td></td>
<td>1</td>
<td>4</td>
<td>15</td>
<td>18</td>
<td>2</td>
<td>1</td>
<td></td>
<td>18</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>4</td>
<td>7</td>
<td>2</td>
<td>1</td>
<td>9</td>
<td>8</td>
<td>4</td>
<td>7</td>
<td>12</td>
<td>28</td>
<td>17</td>
<td>8</td>
<td>108</td>
<td>19</td>
<td>6</td>
<td>114</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
<td>18</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>9</td>
<td>6</td>
<td>11</td>
<td>2</td>
<td>6</td>
<td>3</td>
<td>1</td>
<td>3</td>
<td>12</td>
<td>8</td>
<td>2</td>
<td>3</td>
<td>19</td>
<td>15</td>
<td>12</td>
<td>1</td>
<td>164</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
<td>18</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>10</td>
<td>42</td>
<td>2</td>
<td>15</td>
<td>19</td>
<td>16</td>
<td>27</td>
<td>2</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>4</td>
<td>13</td>
<td>4</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
<td>18</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>10</td>
<td>6</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>5</td>
<td>2</td>
<td>2</td>
<td>10</td>
<td>8</td>
<td>3</td>
<td>11</td>
<td>4</td>
<td>3</td>
<td>7</td>
<td>18</td>
<td>3</td>
<td></td>
<td>18</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>4</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>9</td>
<td>15</td>
<td>15</td>
<td>15</td>
<td>15</td>
<td>15</td>
<td>15</td>
<td>15</td>
<td></td>
<td>15</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>2</td>
<td>7</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td></td>
<td>15</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>25</td>
<td>62</td>
<td>2</td>
<td>80</td>
<td>24</td>
<td>1</td>
<td>46</td>
<td>63</td>
<td>9</td>
<td>16</td>
<td>27</td>
<td>16</td>
<td>2</td>
<td>13</td>
<td>15</td>
<td>115</td>
<td>84</td>
<td>41</td>
<td>9</td>
<td>1</td>
<td>0</td>
<td>639</td>
<td>22</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>7</td>
<td>10</td>
<td>1</td>
<td>14</td>
<td>4</td>
<td>1</td>
<td>9</td>
<td>10</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>6</td>
<td>1</td>
<td>6</td>
<td>14</td>
<td>13</td>
<td>9</td>
<td>5</td>
<td>1</td>
<td>0</td>
<td>22</td>
<td>22</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Species</th>
<th>Salt Fork</th>
<th>Middle Fork</th>
<th>North Fork River</th>
<th>Verm. System</th>
</tr>
</thead>
<tbody>
<tr>
<td>Actinonaias carinata</td>
<td>+</td>
<td>+</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>A. ellipsiformis</td>
<td>-</td>
<td>+</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>Alasmidonta marginata</td>
<td>-</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Amblema plicata</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Anodonta grandis grandis</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>A. imbecillis</td>
<td>-</td>
<td>+</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>Anodontoides ferussacianus</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Carunculina glans</td>
<td>+</td>
<td>+</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>C. parva</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>Cyclonaias tuberculata</td>
<td>-</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Elliptio dilata</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Fusconaia flava</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Lampsilis fasciola</td>
<td>-</td>
<td>+</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>L. ovata ventricosa</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>L. radiata siliquoidea</td>
<td>- + + +</td>
<td>+ + + +</td>
<td>- + + -</td>
<td>+</td>
<td>- + + +</td>
<td>+ + + +</td>
<td>+ + + +</td>
<td>+ + + +</td>
<td>+</td>
<td></td>
<td>- + + +</td>
<td>+ + + +</td>
<td>+ + + +</td>
<td>+ + + +</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>L. teres</td>
<td>- + + -</td>
<td>- - - -</td>
<td>- + + -</td>
<td>-</td>
<td>- + + -</td>
<td>- - - -</td>
<td>- + + -</td>
<td>- - - -</td>
<td>-</td>
<td></td>
<td>- + + -</td>
<td>- - - -</td>
<td>- + + -</td>
<td>- - - -</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Lasmigona complanata</td>
<td>+ + + +</td>
<td>+ + + +</td>
<td>- + + -</td>
<td>+</td>
<td>+ + + -</td>
<td>+ + + +</td>
<td>+ + + +</td>
<td>+ + + +</td>
<td>+</td>
<td></td>
<td>+ + + -</td>
<td>+ + + +</td>
<td>+ + + +</td>
<td>+ + + +</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>L. compressa</td>
<td>- + + -</td>
<td>- - - -</td>
<td>+ + - -</td>
<td>-</td>
<td>+ + - -</td>
<td>- + + -</td>
<td>+ + + -</td>
<td>+ + + -</td>
<td>+</td>
<td></td>
<td>- + + -</td>
<td>- - - -</td>
<td>- + + -</td>
<td>- - - -</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>L. costata</td>
<td>- + + +</td>
<td>- - - -</td>
<td>- + + +</td>
<td>+</td>
<td>- + + +</td>
<td>+ + + +</td>
<td>+ + + +</td>
<td>+ + + +</td>
<td>+</td>
<td></td>
<td>- + + +</td>
<td>+ + + +</td>
<td>+ + + +</td>
<td>+ + + +</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>Ligumia subrostrata</td>
<td>+ - - +</td>
<td>- - - -</td>
<td>- - - -</td>
<td>-</td>
<td>- - - -</td>
<td>- - - -</td>
<td>- + + -</td>
<td>- - - -</td>
<td>-</td>
<td></td>
<td>+ - - +</td>
<td>- - - -</td>
<td>- + + -</td>
<td>- - - -</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Megalonaia gigantea</td>
<td>- - - -</td>
<td>- - - -</td>
<td>- - - -</td>
<td>-</td>
<td>- - - -</td>
<td>- - - -</td>
<td>- - - -</td>
<td>- - - -</td>
<td>-</td>
<td></td>
<td>- - - -</td>
<td>- - - -</td>
<td>- - - -</td>
<td>- - - -</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Obovaria subrotunda</td>
<td>- + + -</td>
<td>+ + + +</td>
<td>- + + -</td>
<td>+</td>
<td>+ + - +</td>
<td>+ + + +</td>
<td>+ + + +</td>
<td>+ + + +</td>
<td>+</td>
<td></td>
<td>+ + - +</td>
<td>+ + + +</td>
<td>+ + + +</td>
<td>+ + + +</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>Pleurobema clava</td>
<td>- + + +</td>
<td>- - - -</td>
<td>- + + -</td>
<td>+</td>
<td>- + + +</td>
<td>+ + + +</td>
<td>+ + + +</td>
<td>+ + + +</td>
<td>+</td>
<td></td>
<td>- + + +</td>
<td>+ + + +</td>
<td>+ + + +</td>
<td>+ + + +</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>P. cordatum</td>
<td>- + + +</td>
<td>+ + + +</td>
<td>- + + -</td>
<td>+</td>
<td>+ + - +</td>
<td>+ + + +</td>
<td>+ + + +</td>
<td>+ + + +</td>
<td>+</td>
<td></td>
<td>+ + - +</td>
<td>+ + + +</td>
<td>+ + + +</td>
<td>+ + + +</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>Ptychobranchus fasciolaris</td>
<td>- - - -</td>
<td>- - - -</td>
<td>- - - -</td>
<td>-</td>
<td>- - - -</td>
<td>- - - -</td>
<td>- - - -</td>
<td>- - - -</td>
<td>-</td>
<td></td>
<td>- - - -</td>
<td>- - - -</td>
<td>- - - -</td>
<td>- - - -</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Quadrula cylindrica</td>
<td>- + + +</td>
<td>- - - -</td>
<td>- + + -</td>
<td>+</td>
<td>- + + -</td>
<td>+ + + +</td>
<td>+ + + +</td>
<td>+ + + +</td>
<td>+</td>
<td></td>
<td>- + + -</td>
<td>- - - -</td>
<td>- + + -</td>
<td>- - - -</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Q. metanevra</td>
<td>- + + +</td>
<td>- - - -</td>
<td>- + + -</td>
<td>+</td>
<td>- + + -</td>
<td>+ + + +</td>
<td>+ + + +</td>
<td>+ + + +</td>
<td>+</td>
<td></td>
<td>- + + -</td>
<td>- - - -</td>
<td>- + + -</td>
<td>- - - -</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Q. pustulosa</td>
<td>- + + +</td>
<td>- - - -</td>
<td>+ + + +</td>
<td>-</td>
<td>- + + +</td>
<td>+ + + +</td>
<td>+ + + +</td>
<td>+ + + +</td>
<td>+</td>
<td></td>
<td>- + + +</td>
<td>+ + + +</td>
<td>+ + + +</td>
<td>+ + + +</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>Q. quadrula</td>
<td>- + + +</td>
<td>- - - -</td>
<td>+ + + +</td>
<td>-</td>
<td>- + + +</td>
<td>+ + + +</td>
<td>+ + + +</td>
<td>+ + + +</td>
<td>+</td>
<td></td>
<td>- + + +</td>
<td>+ + + +</td>
<td>+ + + +</td>
<td>+ + + +</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>Strophitus undulatus</td>
<td>+ + + +</td>
<td>- + + +</td>
<td>+ + + +</td>
<td>-</td>
<td>+ + + +</td>
<td>+ + + +</td>
<td>+ + + +</td>
<td>+ + + +</td>
<td>+</td>
<td></td>
<td>+ + + +</td>
<td>+ + + +</td>
<td>+ + + +</td>
<td>+ + + +</td>
<td>+</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Tritogonia verrucosa</td>
<td>-</td>
<td>+</td>
<td>+</td>
<td>-</td>
<td>+</td>
<td>+</td>
<td>-</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>Uniomerus tetralasmus</td>
<td>+</td>
<td>+</td>
<td>-</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Villosa iris</td>
<td>-</td>
<td>-</td>
<td>+</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>+</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>V. lienosa</td>
<td>-</td>
<td>+</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td>+</td>
<td>-</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>-</td>
</tr>
</tbody>
</table>

Species counts:

| Species         | 12 | 29 | 29 | 24 | 18 | 14 | 15 | 17 | 16 | 3 | 15 | 21 | 21 | 4 | 23 | 29 | 29 | 29 | 19 | 22 |
|-----------------|----|----|----|----|----|----|----|----|----|---|----|----|----|---|----|----|----|----|----|----|---|----|
Appendix I. Data sheets for individual sites on the Vermilion River system from 1980-1981 collections of mussels, water samples and substrate samples.
SITE # 1   STATE IL   COUNTY Champaign   STREAM Salt Fork (Saline Branch)
LOCATION In N. Urbana at Lincoln Ave. br.  T20N,R9E,SE 1/4,Sec. 31 & SW 1/4,Sec. 32
MUSSEL COLLECTION: DATE 24 April 1981 METHOD hand MAN-HOURS 3

<table>
<thead>
<tr>
<th>Actinonaias carinata carinata</th>
<th>Lasmigona costata</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alasmidonta marginata</td>
<td>Obovina subrotunda</td>
</tr>
<tr>
<td>Amblema plicata</td>
<td>Pleurobema cordatum</td>
</tr>
<tr>
<td>Anodonta grandis grandis</td>
<td>Quadrula cylindrica</td>
</tr>
<tr>
<td>Anodontoides ferussacianus</td>
<td>Q. pustulosa</td>
</tr>
<tr>
<td>Cyclonaias tuberculata</td>
<td>Q. quadrula</td>
</tr>
<tr>
<td>Fusconaia flava</td>
<td>Strophitus undulatus</td>
</tr>
<tr>
<td>Lampsilis fasciola</td>
<td>Tritogonia verrucosa</td>
</tr>
<tr>
<td>L. ovata ventricosa</td>
<td>Villosa iris</td>
</tr>
<tr>
<td>L. radiata siliquoida</td>
<td>V. lienosa</td>
</tr>
<tr>
<td>Lasmigona complanata</td>
<td></td>
</tr>
<tr>
<td>L. compressa</td>
<td></td>
</tr>
</tbody>
</table>

no live mussels found

SUBSTRATE: ESTIMATION (% BY VOL.) SILT__ SAND ENGINEERING COBBLE__ BEDROCK__ OTHER__

TRANSECTS (% BY WEIGHT)
CLAY 7.1 SILT 4.8 FINE SAND 1.6 MEDIUM SAND 14.5 COARSE SAND 20.1 GRAVEL 31.8

WATER QUALITY: TEMP °C 8.2  HARDNESS mg/l 337  NO7−NO3 mg/l (560)
DO 8.7  AMMONIA mg/l .51  NITRITE mg/l .01
pH 8.055  PHOSPHATE mg/l .25  NITRATE mg/l (560)

PHYSICAL DATA: WIDTH max 8.5 m
DEPTH max 6 m
FLOW 0 m/sec
LAND USE   industry, junk yard

REMARKS: stream is full of garbage and leaves, lots of clay

MAP
Site # 2  County: Champaign  Stream: Salt Fork (Saline Branch)

Location: In N. Urbana at Urbana Country Club  T19N, R9E, S 1/2, Sec. 5

Mussel Collection: Date: 24 April, 1981  Method: hand  Man-Hours: 3

- Actinonaias carinata carinata
- Alasmidonta marginata
- Amblema plicata
- Anodonta grandis grandis
- Anodontoides ferussacianus
- Cycloniaias tuberculata
- Fusconaia flava
- Lampsilis fasciola
- L. ovata ventricosa
- L. radiata siliquoidea
- Lasmigona complanata
- L. compressa
- Lasmigona costata
- Obovaria subrotunda
- Pleurobema cordatum
- Quadrula cylindrica
- Q. pustulosa
- Q. quadraula
- Strophitus undulatus
- Tritogonia verrucosa
- Villosa iris
- V. lienosa

No live mussels found

Substrate: Estimation (% by Vol.)
- Silt
- Sand
- Gravel
- Cobble
- Bedrock
- Other

Transects (% by Weight)
- Clay: 7.6
- Silt: 10.6
- Fine Sand: 1.6
- Medium Sand: 20.7
- Coarse Sand: 32.8
- Gravel: 28.2

Water Quality:
- Temp °C: 10.2
- DO: 6.8
- pH: 7.808
- Hardness mg/l: 327
- Ammonia mg/l: 0.29
- Phosphate mg/l: 1.15
- NO₂-NO₃ mg/l: 0.8
- Nitrite mg/l: 0.01
- Nitrate mg/l: 3.4

Physical Data:
- Width max: 11.5 m
- Depth max: 5 m
- Flow: 0 m/sec
- Land Use: Urban, Golf Course

Remarks:

Map
SITE # 3  STATE IL  COUNTY Champaign  STREAM Salt Fork (Saline Branch)
LOCATION 3-1/2 mi NE of St. Joseph  T19N,R10E,SW 1/4,Sec. 5.

MUSSEL COLLECTION: DATE 24 April 1981  METHOD hand  MAN-HOURS 3

Actinonaias carinata carinata
Alasmidonta marginata
Amblema plicata
Anodonta grandis grandis
Anodontoides ferussacianus
Cyclonaias tuberculata
Fusconaia flava
Lampsilis fasciola
L. ovata ventricosa
L. radiata siliquoidea
Lasmigona complanata
L. compressa
Lasmigona costata
Obovaria subrotunda
Pleurobema cordatum
Quadrula cylindrica
Q. pustulosa
Q. quadrula
Strophitus undulatus
Tritogonia verrucosa
Villosa iris
V. lienosa

no live mussels found

SUBSTRATE: ESTIMATION (% BY VOL.) SILT__ SAND__ GRAVEL__ COBBLE__ BEDROCK__ OTHER__

TRANSECTS (% BY WEIGHT)
CLAY 4.8  SILT 1.6  FINE SAND 2.0  MEDIUM SAND 27.9  COARSE SAND 27.0  GRAVEL 36.5

WATER QUALITY: TEMP °C 10.5  HARDNESS mg/l 162  NO₂⁻NO₃ mg/l 1.17
DO 7.0  AMMONIA mg/l 18.1  NITRITE mg/l 0.04
pH 7.732  PHOSPHATE mg/l 7.5  NITRATE mg/l 0.13

PHYSICAL DATA: WIDTH max 12.7m  DEPTH max 7 m
FLOW 2 m/sec
LAND USE agricultural

REMARKS: ___________________________________________________________________

MAP

[Map showing field and substrate transects]
SITE # 4  STATE  IL  COUNTY  Champaign  STREAM  Salt Fork

LOCATION  W edge of St. Joseph  T19N,R10E,NE 1/4, Sec. 15 & SE 1/4, Sec. 10

MUSSEL COLLECTION:  DATE  22 Oct 1980  METHOD  hand  MAN-HOURS  3

- Actinonaias carinata carinata
- Alasmidonta marginata
- Amblemma plicata
- Anodonta grandis grandis
- Anodontoides ferussacianus
- Cyclonaias tuberculata
- Fusconaia flava
- Lampsilis fasciola
- L. ovata ventricosa
- L. radiata siliquoidea
- Lasmigona complanata
- L. compressa

no live mussels found

SUBSTRATE:  ESTIMATION (% BY VOL.)  SILT 20  SAND 70  GRAVEL 10  COBBLE  BEDROCK  OTHER

TRANSECTS (% BY WEIGHT)
CLAY 5.2  SILT 2.3  FINE SAND 2.4  MEDIUM SAND 39.3  COARSE SAND 25.2  GRAVEL 25.5

WATER QUALITY:
- TEMP °C  7.0
- DO  7.2
- pH  8.091
- HARDNESS mg/l  204
- AMMONIA mg/l  11.9
- PHOSPHATE mg/l  17.2
- NO₂-NO₃ mg/l  .61
- NITRITE mg/l  .09
- NITRATE mg/l  .52

PHYSICAL DATA:
- WIDTH max  22 m
- DEPTH max  3 m
- FLOW  3 m/sec
- LAND USE  agricultural

REMARKS:

MAP

[Map showing site with field, old bridge, U.S. 150, transects, and location details]
SITE # 5 STATE IL COUNTY Champaign STREAM Salt Fork

LOCATION 2 mi N of Sidney T18N,R10E,NW 1/4,Sec 4 & T19N,R10E,SW 1/4,Sec 33

MUSSEL COLLECTION: DATE 24 April 1981 METHOD hand MAN-HOURS 3

Actinonaias carinata carinata Lasmigona costata
Alasmidonta marginata Obovaria subrotunda
Amblema plicata Pleurobema cordatum
Anodonta grandis grandis Quadrula cylindrica
Anodontoides ferussacianus Q. pustulosa
Cyclonaias tuberculata Q. quadrula
Fusconaia flava Strophitus undulatus
Lampsilis fasciola Tritogonia verrucosa
L. ovata ventricosa Villosa iris
L. radiata siliquoidea V. lienosa
Lasmigona complanata
L. compressa

no live mussels found

SUBSTRATE: ESTIMATION (% BY VOL.) SILT__SAND__GRAVEL__COBBLE__BEDROCK__OTHER__

TRANSECTS (% BY WEIGHT)
CLAY11, SILT17,4 FINE SAND4,9 MEDIUM SAND38,4 COARSE SAND4,8 GRAVEL23,1

WATER QUALITY: TEMPERATURE °C 6.5 HARDNESS mg/l 198 NO₂-NO₃ mg/l .77
DO 7.5 AMMONIA mg/l 11.0 NITRITE mg/l .37
pH 7.951 PHOSPHATE mg/l 13.7 NITRATE mg/l .40

PHYSICAL DATA: WIDTH max 11 m
DEPTH max 6 m
FLOW 3 m/sec
LAND USE agricultural

REMARKS: ---------------------------------------------

MAP

(map with labeled field, wooded, road, substrate, transects, and TN)
SITE # 6 STATE IL COUNTY Champaign STREAM Salt Fork
LOCATION 1 mi NE of Sidney T18N,R10E,W 1/2,Sec 10
MUSSEL COLLECTION: DATE 22 Oct 1980 METHOD hand MAN-HOURS 3

- Actinonaias carinata carinata
- Alasmidonta marginata
- Amblema plicata
- Anodonta grandis grandis
- Anodontoides ferrussacianus
- Cyclonaias tuberculata
- Fusconaia flava
- Lampsilis fasciola
- L. ovata ventricosa
- L. radiata siliquoidea
- Lasmigona complanata
- L. compressa

- Lasmigona costata
- Obovaria subrotunda
- Pleurobema cordatum
- Quadrula cylindrica
- Q. pustulosa
- Q. quadrula
- Strophitus undulatus
- Tritogonia verrucosa
- V. lienosa

no live mussels found (few dead ones)

SUBSTRATE: ESTIMATION (% BY VOL.) SILT 40 SAND 60 GRAVEL COBBLE BEDROCK OTHER

- heavy silt at edges of stream

TRANSECTS (% BY WEIGHT)
CLAY 16.6 SILT 29.5 FINE SAND 3.9 MEDIUM SAND 45.9 COARSE SAND 2.7 GRAVEL 1.2

WATER QUALITY:
TEMP °C 6.5 HARDNESS mg/l 216 NO₂⁻NO₃ mg/l .77
DO 10.3 AMMONIA mg/l 9.8 NITRITE mg/l .14
pH 7.883 PHOSPHATE mg/l 13.9 NITRATE mg/l .63

PHYSICAL DATA:
WIDTH max 18 m
DEPTH max .9 m
FLOW Q m/sec
LAND USE agricultural

REMARKS:

MAP
SITE # 7  STATE IL  COUNTY Champaign  STREAM Salt Fork  

LOCATION  3 mi NW of Homer  T18N,R10E,NE 1/4,Sec 1 & T18N,R11E,NW 1/4,Sec 6  

MUSSEL COLLECTION: DATE 22 Oct 1980  METHOD hand  MAN-HOURS 3  

---

Actinonaias carinata carinata  
Alasmidonta marginata  
Amblema plicata  
Anodonta grandis grandis  
Anodontoides ferussacianus  
Cyclonaias tuberculata  
Fusconaia flava  
Lampsilis fasiola  
L. ovata ventricosa  
L. radiata siliquoidea  
Lasmigona complanata  
L. compressa  
Lasmigona costata  
Obovaria subrotunda  
Pleurobema cordatum  
Quadrula cylindrica  
Q. pustulosa  
Q. quadrula  
Strophitus undulatus  
Trigonia verrucosa  
Villosa iris  
V. lienosa  

SUBSTRATE: ESTIMATION (% BY VOL.) Silt 50  Sand 50  Gravel  Cobble  Bedrock  Other  
---

lots of silt across streambed, 1-2' at edges  
TRANSECTS (% BY WEIGHT)  
---

CLAY 19.4  SILT 29.7  FINE SAND 8.3  MEDIUM SAND 36.0  COARSE SAND 24.1  GRAVEL 2.0  

WATER QUALITY:  
TEMP °C  7.5  HARDNESS mg/l  210  NO₂⁻NO₃ mg/l  .61  
DO  11.0  AMMONIA mg/l  8.6  NITRITE mg/l  .09  
pH  7.824  PHOSPHATE mg/l  12.9  NITRATE mg/l  .52  

PHYSICAL DATA:  
WIDTH max  25 m  
DEPTH max  .9 m  
FLOW  0 m/sec  
LAND USE wooded  

REMARKS:  

MAP  

---
SITE # 8  STATE  IL  COUNTY  Champaign  STREAM  Salt Fork

LOCATION  2 mi NW of Homer  T18N,R14W,NW 1/4,Sec 6

MUSSEL COLLECTION: DATE 19 Sept 1980 METHOD  hand  MAN-HOURS 3

- Actinonaias carinata carinata
- Alasmidonta marginata
- Amblema plicata
- Anodonta grandis grandis
- Anodontaoides ferussacianus
- Cyclonaias tuberculata
- Fusconaia flava
- Lampsilis fasciola
- L. ovata ventricosa
- L. radiata siliquoidea
- Lasmigona complanata
- L. compressa
- L. costata
- L. compressa
- Obovaria subrotunda
- Pleurobema cordatum
- Quadrula cylindrica
- Q. pustulosa
- Q. quadrula
- Strophitus undulatus
- Tritogonia verrucosa
- V. lienosa
- V. lienosa
- V. lienosa
- V. lienosa

SUBSTRATE: ESTIMATION (% BY VOL.) SILT 10  SAND 40  GRAVEL 50  COBBLE  BEDROCK  OTHER

TRANSECTS (% BY WEIGHT)
CLAY 5.6  SILT 7.9  FINE SAND 0.6  MEDIUM SAND 22.5  COARSE SAND 8.4  GRAVEL 55.0

WATER QUALITY:
- TEMP °C 11.0
- DO 6.2
- pH 7.727

PHYSICAL DATA:
- WIDTH max 21 m
- DEPTH max .6 m
- FLOW .3 m/sec
- LAND USE wooded

REMARKS: smelled septic

MAP
SITE # 9  STATE IL  COUNTY Champaign  STREAM Salt Fork

LOCATION 1-1/2 mi N of Homer at IL 49 br.  T19N,R14W,SW 1/4, Sec 33

MUSSEL COLLECTION: DATE 14 Aug 1980 METHOD hand  MAN-HOURS 3

Actinonaias carinata carinata  Lasmigona costata
Alasmidonta marginata  Obovaria subrotunda
Amblema plicata  Pleurobema cordatum
Anodonta grandis grandis  Quadrula cylindrica
Anodontoides ferussacianus  Q. pustulosa
Cyclonaias tuberculata  1 Q. quadrula
Fusconaia flava  1 Strophitus undulatus
Lampsilis fasciola  2 Tritogonia verrucosa
L. ovata ventricosa  L. radiata siliquoidea
L. ovata ventricosa  V. lienosa
L. radiata siliquoidea
Lasmigona complanata
L. compressa

SUBSTRATE: ESTIMATION (% BY VOL.) SILT10 SAND50 GRAVEL40 COBBLE_ BEDROCK_ OTHER_

TRANSECTS (% BY WEIGHT)
CLAY5.1 SILT6.5 FINE SAND0.9 MEDIUM SAND10.9 COARSE SAND9.0 GRAVEL68.4

WATER QUALITY: TEMP °C 7.0  HARDNESS mg/l 218  NO₂-NO₃ mg/l .65
DO 8.0  AMMONIA mg/l 8.1  NITRITE mg/l .07
pH 7.750  PHOSPHATE mg/l/12.9  NITRATE mg/l .58

PHYSICAL DATA: WIDTH max 17 m
DEPTH max 6 m
FLOW .4 m/sec
LAND USE wooded

REMARKS: this is the site where Homer dam once was

MAP
SITE # 10  STATE IL  COUNTY Vermilion  STREAM Salt Fork
LOCATION 2-1/2 mi NE of Homer at WICD tower  T19N, R14W, SW 1/4, Sec 26
MUSSEL COLLECTION: DATE 14 Aug 1980 METHOD hand  MAN-HOURS 3

3 Actinonaias carinata carinata
4 Alasmidonta marginata
3 Amblema plicata
1 Anodonta grandis grandis
1 Anodontoides ferussacianus
4 Cyclonaias tuberculata
1 Fusconaia flava
1 Lampsilis fasciola
4 L. ovata ventricosa
6 L. radiata siliquoidea
42 Lasmigona complanata
1 L. compressa

Lasigmona costata
Obovaria subrotunda
Pleurobema cordatum
Quadrula cylindrica
Q. pustulosa
Q. quadrula
Strophitus undulatus
Tritogonia verrucosa
Villosa iris
V. lienis

SUBSTRATE: ESTIMATION (% BY VOL.) SILT 10 SAND 50 GRAVEL 40 COBBLE  BEDROCK  OTHER
TRANSECTS (% BY WEIGHT)
CLAY 6.5 SILT 4.0 FINE SAND 1.2 MEDIUM SAND 23.3 COARSE SAND 5.9 GRAVEL 58.6
WATER QUALITY: TEMP °C 7.0
DO 11.9
pH 7.556
HARDNESS mg/l 216
AMMONIA mg/l 6.8
PHOSPHATE mg/l 12.9
NO₂-N0₃ mg/l .98
NITRITE mg/l .06
NITRATE mg/l .92

PHYSICAL DATA: WIDTH max 29 m
DEPTH max .8 m
FLOW .7 m/sec
LAND USE agricultural
REMARKS: lots of dead shells, clams (live) scattered throughout sample area

MAP
SITE # 11 STATE IL COUNTY Vermilion STREAM Salt Fork

LOCATION 2 mi S of Muncie T19N,R13W,SW 1/4, Sec 21

MUSSEL COLLECTION: DATE 19 Sept 1980 METHOD hand MAN-HOURS 3

Actinonaias carinata carinata
Alasmidonta marginata
Amblemma plicata
Anodonta grandis grandis
Anodontoides ferussacianus
Cyclonaias tuberculata
Fusconaia flava
Lampsilis fasciola
L. ovata ventricosa
L. radiata siliquoidea
Lasmigona complanata
L. compressa

Lasigmongna costata
Obovaria subrotunda
Pleurobema cordatum
Quadrula cylindrica
Q. pustulosa
Q. quadrula
Strophitus undulatus
Tritogonia verrucosa
Villosa iris
V. lienosa

SUBSTRATE: ESTIMATION (% BY VOL.) SILT 20 SAND 30 GRAVEL 30 COBBLE 20 BEDROCK OTHER

TRANSECTS (% BY WEIGHT)
CLAY 8.7 SILT 10.4 FINE SAND 2.8 MEDIUM SAND 9.0 COARSE SAND 8.4 GRAVEL 60.7

WATER QUALITY: TEMP °C 7.0 HARDNESS mg/1 245 NO₃-NO₂ mg/1 2.97
DO 9.2 AMMONIA mg/1 4.3 NITRITE mg/1 .10
pH 7.832 PHOSPHATE mg/1 14.6 NITRATE mg/1 2.87

PHYSICAL DATA: WIDTH max 28 m
DEPTH max >1.5 m
FLOW 4 m/sec
LAND USE wooded

REMARKS:

MAP

[Image of a map showing wooded areas, exposed rock, and other features.]
SITE # 12  STATE  IL  COUNTY  Vermilion  STREAM  Salt Fork

LOCATION  3 mi SW of Oakwood  T19N,R13W,NW 1/4, Sec 26

MUSSLE COLLECTION: DATE  METHOD  MAN-HOURS

- Actinonaias carinata carinata
- Alasmidonta marginata
- Amblema plicata
- Anodontida grandis grandis
- Anodontoides ferussacianus
- Cyclonaias tuberculata
- Fusconaia flava
- Lampsilis fasciola
- Lampsis fasciola
- L. ovata ventricosa
- L. radiata siliquoidea
- Lasmigona complanata
- L. compressa

SUBSTRATE: ESTIMATION (% BY VOL.)  SILT  SAND  GRAVEL  COBBLE  BEDROCK  OTHER

TRANSECTS (% BY WEIGHT)
CLAY  4.8  SILT  4.8  FINE SAND  1.5  MEDIUM SAND  6.3  COARSE SAND  5.7  GRAVEL  76.7

WATER QUALITY:  TEMP °C  7.0  HARDNESS mg/l  245
DO  10.0  AMMONIA mg/l  2.6
pH  7.765  PHOSPHATE mg/l  4.4

PHYSICAL DATA:  WIDTH max  22 m
DEPTH max  -- m
FLOW  3 m/sec
LAND USE  wooded

REMARKS:

MAP
SITE # 13  STATE IL  COUNTY Vermilion  STREAM Salt Fork

LOCATION  2-1/2 mi N of Catlin at jct. with Middle Fork  T19N,R12W,SE 1/4,Sec 16

MUSSEL COLLECTION: DATE  24 July 1980  METHOD hand  MAN-HOURS 3

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>Actinonaias carinata carinata</td>
<td>Lasmigona costata</td>
</tr>
<tr>
<td>3</td>
<td>Alasmidonta marginata</td>
<td>Obovaria subrotunda</td>
</tr>
<tr>
<td>5</td>
<td>Amblema plicata</td>
<td>Pleurobema cordatum</td>
</tr>
<tr>
<td>1</td>
<td>Anodonta grandis grandis</td>
<td>Quadrula cylindrica</td>
</tr>
<tr>
<td>1</td>
<td>Anodontoides ferussacianus</td>
<td>Q. pustulosa</td>
</tr>
<tr>
<td></td>
<td>Cyclonaias tuberculata</td>
<td>7 Q. quadrula</td>
</tr>
<tr>
<td>9</td>
<td>Fusconaia flava</td>
<td>1 Strophitus undulatus</td>
</tr>
<tr>
<td>4</td>
<td>Lampsilis fasciola</td>
<td>7 Tritogonia verrucosa</td>
</tr>
<tr>
<td>7</td>
<td>L. ovata ventricosa</td>
<td>1 V. lienosa</td>
</tr>
<tr>
<td>11</td>
<td>L. radiata siliquoidea</td>
<td>7 L. compressa</td>
</tr>
<tr>
<td>15</td>
<td>Lasmigona complanata</td>
<td>1 Obovaria subrotunda</td>
</tr>
<tr>
<td></td>
<td>L. compressa</td>
<td>7 L. compressa</td>
</tr>
</tbody>
</table>

SUBSTRATE: ESTIMATION (% BY VOL.) SILT 20 SAND 40 GRAVEL 40 COBBLE 16 OTHER

TRANSECTS (% BY WEIGHT)
CLAY 8.6 SILT 12.5 FINE SAND 1.3 MEDIUM SAND 23.7 COARSE SAND 27.0 GRAVEL 16.4

WATER QUALITY:
TEMP °C 8.0  HARDNESS mg/l 254
DO 13.1  AMMONIA mg/l 1.00
pH 8.111  PHOSPHATE mg/l 13.0
NO_2 NO_3 mg/l 4.10  NITRITE mg/l .22
NITRATE mg/l 3.88

PHYSICAL DATA:
WIDTH max 16 m (actual water width, streambed is 30 m)
DEPTH max .5 m
FLOW 0.2 cfs
LAND USE wooded, recreational

REMARKS: pile of cleaned shells found

MAP

[Map showing the site location, mussel collection site, and substrate and transect locations.]
SITE # 14  STATE IL  COUNTY Ford  STREAM Middle Fork

LOCATION 4-1/2 mi WSW of Paxton  T23N, R9E, SE 1/4, Sec 15.

MUSSEL COLLECTION: DATE 10 Oct 1980  METHOD hand  MAN-HOURS 3

Actinonaias carinata carinata
Alasmidonta marginata
Amblema plicata
Anodonta grandis grandis
Anodontoides ferussacianus
Cyclonaias tuberculata
Fusconaia flava
Lampsilis fasciola
L. ovata ventricosa
L. radiata siliquoidea
Lasmigona complanata
L. compressa
L. costata
Obovaria subrotunda
Pleurobema cordatum
Quadrula cylindrica
Q. pustulosa
Q. quadrula
Strophitus undulatus
Tritogonia verrucosa
Villosa iris
V. lienosa

SUBSTRATE: ESTIMATION (% BY VOL.) SILT 15  SAND 70  GRAVEL 10  COBBLE 5  BEDROCK  OTHER

TRANSECTS (% BY WEIGHT)
CLAY 11.4  SILT 10.4  FINE SAND 2.0  MEDIUM SAND 25.9  COARSE SAND 24.1  GRAVEL 26.1

WATER QUALITY: TEMP °C 10.8
DO 11.8
pH 8.453
HARDNESS mg/l 335
AMMONIA mg/l .20
PHOSPHATE mg/l 1.01
NO₃-N mg/l .08
NITRITE mg/l .01
NITRATE mg/l .07

PHYSICAL DATA: WIDTH max 13 m
DEPTH max 5 m
FLOW 0 m/sec
LAND USE agricultural

REMARKS: ditch, lots of glass

MAP
SITE # 15   STATE  IL   COUNTY  Ford   STREAM  Middle Fork

LOCATION  4-1/2 mi SE of Paxton  T23N, R10E, SW 1/4, Sec 34

MUSSEL COLLECTION: DATE  10 Oct 1980  METHOD  hand  MAN-HOURS  3

Actinonaias carinata carinata  Lasmigona costata
Alasmidonta marginata  Obovaria subrotunda
Amblema plicata  Pleurobema cordatum
Anodonta grandis grandis  Quadrula cylindrica
Anodontoides ferussacianus  Q. pustulosa
Cyclonaias tuberculata  Q. quadula
Fusconaia flava  Strophitus undulatus
Lampsilis fasciola  Tritogonia verrucosa
L. ovata ventricosa  V. lienosa
L. radiata siliquoidea
Lasmigona complanata
L. compressa

SUBSTRATE: ESTIMATION (% BY VOL.)  SILT 15  SAND 80  GRAVEL 5  COBBLE 6  OTHER 5

TRANSECTS (% BY WEIGHT)
CLAY 9.7  SILT 9.6  FINE SAND 2.8  MEDIUM SAND 35.3  COARSE SAND 27.9  GRAVEL 14.1

WATER QUALITY:  TEMP °C  11.2  HARDNESS mg/1 341  NO₂⁻NO₃⁻ mg/1 .33
DO 12.2  AMMONIA mg/1 1.68  NITRITE mg/1 .07
pH 8.647  PHOSPHATE mg/12.2  NITRATE mg/1 .26

PHYSICAL DATA:  WIDTH max 15 m  DEPTH max 3 m  FLOW 1 m/sec

LAND USE  agricultural

REMARKS:  lots of muskrat holes in bank, cow pasture upstream of bridge

MAP
SITE # 16 STATE IL COUNTY Champaign STREAM Middle Fork
LOCATION 9 mi SE of Paxton T22N,R14W,SW 1/4,Sec 5

MUSSEL COLLECTION: DATE 26 Sept 1987 METHOD hand MAN-HOURS 3

1 Actinonaias carinata carinata
1 Alasmidonta marginata
Ambela plicata
5 Anodonta grandis grandis
Anodontoides ferussacianus
Cyclonaias tuberculata
1 Lasmigona costata
Obovaria subrotunda
Pleurobema cordatum
Quadrula cylindrica

2 Fusconaia flava
Lampsilis fasciola
9 L. ovata ventricosa
10 L. radiata siliquoidea
16 L. ovata ventricosa
L. compressa

SUBSTRATE: ESTIMATION (% BY VOL.) SILT 30 SAND 50 GRAVEL 20 COBBLE  OTHER

TRANSECTS (% BY WEIGHT)
CLAY 9.8 SILT 11.2 FINE SAND 2.3 MEDIUM SAND 35.0 COARSE SAND 18.8 GRAVEL 22.8

WATER QUALITY: TEMP °C 10.8 HARDNESS mg/L 332 NO2-NO3 mg/L .08
DO 9.9 AMMONIA mg/L .21 NITRITE mg/L .01
pH 7.866 PHOSPHATE mg/L 1.62 NITRATE mg/L .07

PHYSICAL DATA: WIDTH max 12 m DEPTH max 6 m FLOW 0 m/sec
LAND USE agricultural

REMARKS: banks badly eroded at outer sides of meanders

MAP
SITE # 17    STATE IL    COUNTY Vermilion    STREAM Middle Fork

LOCATION 5 miW of Potomac    T21N, R14W, SE 1/4, Sec 2

MUSSEL COLLECTION: DATE 26 Sept 1980

METHOD: hand

MAN-HOURS: 3

Actinonaias carinata carinata
Alasmidonta marginata
Ambela plicata
Anodonta grandis grandis
Anodontoides ferussacianus
Cyclonaias tuberculata
Fusconaia flava
Lampsilis fasciola
L. ovata ventricosa
L. radiata siliquoidea
Lasmigona complanata
L. compressa

Lasmigona costata
Obovaria subrotunda
Pleurobema cordatum
Quadrula cylindrica
Q. pustulosa
Q. quadrula
Strophitus undulatus
Tritogonia verrucosa
Villosa iris
V. lienosa

SUBSTRATE: ESTIMATION (% BY VOL.)
SILT 10    SAND 60    GRAVEL 30    COBBLE    BEDROCK    OTHER

TRANSECTS (% BY WEIGHT)
CLAY 10.7    SILT 10.4    FINE SAND 0.7    MEDIUM SAND 18.2    COARSE SAND 23.4    GRAVEL 36.7

WATER QUALITY:
TEMP °C: 9.0
DO: 11.4
pH: 7.960

HARDNESS mg/l: 325
AMMONIA mg/l: 0.18
PHOSPHATE mg/l: 1.01
NO₂⁻NO₃ mg/l: 0.16
NITRITE mg/l: 0.01
NITRATE mg/l: 0.15

PHYSICAL DATA:
WIDTH max 18 m
DEPTH max 6 m
FLOW 1 m/sec
LAND USE wooded

REMARKS: layer of silt on most areas of streambed

MAP

[Diagram showing streambed details]
SITE # 18  STATE IL  COUNTY Vermilion  STREAM Middle Fork

LOCATION 1-1/2 mi S of Potomac  T21N,R13W,NE 1/4, Sec 15

MUSSEL COLLECTION: DATE 26 Sept 1980 METHOD hand MAN-HOURS 3

1 Actinonaias carinata carinata
2 Alasmidonta marginata
3 Amblema plicata
4 Anodonta grandis grandis
5 Anodontoides ferussacianus
6 Cyclonaias tuberculata
7 Fusconaia flava
8 Lampsilis fasciola
9 L. ovata ventricosa
10 L. radiata siliquoidea
11 Lasmigona complanata
12 L. compressa
13 Lasmigona costata
14 Obovaria subrotunda
15 Pleurobema cordatum
16 Quadrula cylinodrina
17 Q. pustulosa
18 Q. quadrula
19 Strophitus undulatus
20 Tritogonia verrucosa
21 Villosa iris
22 V. lienosa

SUBSTRATE: ESTIMATION (% BY VOL.)
SILT 5  SAND 45  GRAVEL 5  COBBLE  BEDROCK  OTHER
TRANSECTS (% BY WEIGHT)
CLAY 3.9  SILT 6.8  FINE SAND 1.2  MEDIUM SAND 14.3  COARSE SAND 20.8  GRAVEL 52.9

WATER QUALITY: TEMP °C 9.2  HARDNESS mg/l 313  NO₃ - NO₂ mg/l  .08
DO 11.4  AMMONIA mg/l .23  NITRITE mg/l .01
pH 7.987  PHOSPHATE mg/l 1.01  NITRATE mg/l .07

PHYSICAL DATA: WIDTH max 19 m
DEPTH max .5 m
FLOW .1 m/sec
LAND USE agricultural

REMARKS: water turbid, nice place but few clams

MAP
SITE # 19  STATE IL  COUNTY Vermilion  STREAM Middle Fork

LOCATION 7-1/2 mi S of Potomac T21N, R12W, NE 1/4, SW 1/4, Sec 8
(in Middle Fork State Fish and Wildlife Area)

MUSSEL COLLECTION: DATE 13 Nov 1980  METHOD hand  MAN-HOURS 3

Actinonaias carinata carinata  Lasmigona costata
Alasmidonta marginata  Obovaria subrotunda
Ambela plicata  Pleurobema cordatum
Anodonta grandis grandis  Quadrula cylindrica
1 Anodontoides ferussacianus  Q. pustulosa
Cyclonaias tuberculata  Q. quadrula
2 Fusconaia flava  Strophitus undulatus
Lampsilis fasciola  Tritogonia verrucosa
7 L. ovata ventricosa  Villosa iris
3 L. radiata siliquoidea
3 Lasmigona complanata  V. lienosa
3 L. compressa

SUBSTRATE: ESTIMATION (% BY VOL.)
SILT 10  SAND 60  GRAVEL 30  COBBLE  BEDROCK  OTHER

TRANSECTS (% BY WEIGHT)
CLAY 2.1  SILT 10  FINE SAND 1.0  MEDIUM SAND 21.7  COARSE SAND 12.8  GRAVEL 44.9

WATER QUALITY:
TEMP °C 11.0  HARDNESS mg/1 283  NO₂⁻⁻NO₃⁻ mg/1 .08
DO 14.0  AMMONIA mg/1 .09  NITRITE mg/1 .01
pH 8.170  PHOSPHATE mg/1 1.01  NITRATE mg/1 .07

PHYSICAL DATA:
WIDTH max 19 m
DEPTH max 8 m
FLOW 1 m/sec

LAND USE recreational

REMARKS: silt over most of streambed

MAP
SITE # 20  STATE IL  COUNTY Vermilion  STREAM Middle Fork

LOCATION  2-1/2 mi N of Catlin at jct. with Salt Fork  T12N,R12W,SE 1/4,Sec 16

MUSSEL COLLECTION: DATE 24 July 1980  METHOD hand  MAN-HOURS 3

Actinonaias carinata carinata
Alasmidonta marginata
Amblema plicata
Anodonta grandis grandis
Anodontoides ferussacianus
Cyclonaias tuberculata
Fusconaia flava
Lampsilis fasciola
12 L. ovata ventricosa
12 L. radiata siliquoidea
1 Lasmigona complanata

Lasigma costata
Obovaria subrotunda
Pleurobema cordatum
Quadrula cylindrica
Q. pustulosa
Q. quadrula
Strophitus undulatus
Tritogonia verrucosa
Villosa iris
V. lienosa

SUBSTRATE: ESTIMATION (% BY VOL.) Silt 10  Sand 50  Gravel 40  Cobble  Bedrock  Other

TRANSECTS (% BY WEIGHT)
Clay 5.6  Silt 2.3  Fine Sand 4.8  Medium Sand 13.4  Coarse Sand 17.0  Gravel 57.3

WATER QUALITY: TEMP °C 7.0  HARDNESS mg/1 412  NO₂⁻NO₃ mg/1 .08
DO 11.0  AMMONIA mg/1 .06  NITRITE mg/1 .01
pH 8.208  PHOSPHATE mg/1 .01  NITRATE mg/1 .07

PHYSICAL DATA: WIDTH max 8 m (streambed max width 21 m)
DEPTH max .6 m
FLOW .1 m/sec
LAND USE wooded, recreational

REMARKS:

MAP
SITE # 21  STATE IL   COUNTY Vermilion  STREAM North Fork
LOCATION  1-1/2 mi E of Hoopeston at IL 9 br.  T23N,R11W,NE 1/4,Sec 18
MUSSELM COLLECTION: DATE 7 Aug 1980  METHOD hand  MAN-HOURS 3

Actinonaias carinata carinata  Lasigmoida costata
Alasmidonta marginata  1 Obovaria subrotunda
Amblema plicata  Pleurobema cordatum
Anodonta grandis grandis  Quadrula cylindrica
4 Anodontoides ferussacianus  Q. pustulosa
Cyclonaias tuberculata  Q. quadrula
1 Fusconaia flava  Strophitus undulatus
Lampsilis fasciola  Tritogonia verrucosa
L. ovata ventricosa  Villo sa iris
8 L. radiata siliquoidea  1 V. lienosa
1 Lasmigona complanata
1 L. compressa

SUBSTRATE: ESTIMATION (% BY VOL.) SILT30 SAND40 GRAVEL30 COBBLE BEDROCK OTHER

TRANSECTS (% BY WEIGHT)
CLAY7.4 SILT6.1 FINE SAND2.4 MEDIUM SAND10.1 COARSE SAND15.6 GRAVEL58.0

WATER QUALITY: TEMP oC 10.5  HARDNESS mg/1 343  NO2--NO3 mg/1 .08
DO 5.1  AMMONIA mg/1 .12  NITRITE mg/1 .01
pH 7.668  PHOSPHATE mg/1.07  NITRATE mg/1 .07

PHYSICAL DATA: WIDTH max 9 m
DEPTH max .3 m
FLOW 0 m/sec
LAND USE agricultural

REMARKS: most clams at edge of stream on top of silt

MAP
SITE # 22  STATE IL  COUNTY Vermilion  STREAM North Fork

LOCATION  2-1/2 mi N of Rossville  T23N,R12W,NW 1/4, Sec 35

MUSSELM COLLECTION: DATE  7 Aug 1980  METHOD hand  MAN-HOURS 3

- Actinonaias carinata carinata
- Alasmidonta marginata
- Amblema plicata
- Anodonta grandis grandis
- Anodontoides ferussacianus
- Cyclonaias tuberculata
- Fusconaia flava
- Lampsilis fasciola
- L. ovata ventricosa
- 2 L. radiata siliquoidea
- Lasmigona complanata
- L. compressa
- Lasigmonga costata
- Obovaria subrotunda
- Pleurobema cordatum
- Quadrula cylindrica
- Q. pustulosa
- Q. quadrula
- Strophitus undulatus
- Trigonia verrucosa
- V. lienosa

SUBSTRATE: ESTIMATION (% BY VOL.) SILT 10 SAND 80 GRAVEL 10 COBBLE  BEDROCK  OTHER

TRANSECTS (% BY WEIGHT)
CLAY 9.8 SILT 10.9 FINE SAND 2.6 MEDIUM SAND 21.8 COARSE SAND 22.4 GRAVEL 29.4

WATER QUALITY: TEMP °C 12.9  HARDNESS mg/l 347  NO₂-NO₃ mg/l 6.91
DO 10.6  AMMONIA mg/l .24  NITRITE mg/l .20
pH 8.613  PHOSPHATE mg/l2.1  NITRATE mg/l 6.7

PHYSICAL DATA: WIDTH max 11 m
DEPTH max 2 m
FLOW 0 m/sec
LAND USE agricultural

REMARKS: silt layer over sand, clear enough to look for clams, not many dead shells

MAP
SITE # 23  STATE IL  COUNTY Vermilion  STREAM North Fork
LOCATION 2 mi SW of Rossville  T22N,R12W,NE 1/4,Sec 23
MUSSEL COLLECTION: DATE 7 Aug 1980  METHOD hand  MAN-HOURS 3

Actinonaias carinata carinata
Alasmidonta marginata
Anodonta grandis grandis
Anodontaferussacianus
Cyclonaias tuberculata
Fusconaias flava
Lampsilis fasciola
L. ovata ventricosa
L. radiata siliquoidea
Lasmigona complanata
L. compressa

Lasmigona costata
Obovaria subrotunda
Pleurobema cordatum
Quadrula cylindrica
Q. pustulosa
Q. quadrula
Strophitus undulatus
Tritogonia verrucosa
Villosa iris
V. lienosa

SUBSTRATE: ESTIMATION (% BY VOL.) SILT 15 SAND 50 GRAVEL 25 COBBLE 10 BEDROCK OTHER
TRANSECTS (% BY WEIGHT)
CLAY 7.3 SILT 7.8 FINE SAND 1.2 MEDIUM SAND 18.8 COARSE SAND 18.5 GRAVEL 46.4

WATER QUALITY: TEMP °C 12.5 HARDNESS mg/l 333 NO₂ -NO₃ mg/l 1.87
DO 12.4 AMMONIA mg/l .12 NITRITE mg/l .05
pH 8.283 PHOSPHATE mg/l 1.24 NITRATE mg/l 1.82

PHYSICAL DATA: WIDTH max 8 m
DEPTH max 9 m
FLOW max 2 m/sec
LAND USE agricultural

REMARKS: silt over most of substrate

MAP
SITE # 24  STATE  IL  COUNTY  Vermilion  STREAM  North Fork
LOCATION  3/4 mi E of Alvin  T21N,R11W,SW 1/4,Sec 5
MUSSEL COLLECTION: DATE  7 Aug 1980  METHOD  hand  MAN-HOURS  3

1  Actinonaias carinata  10  Lasmigona costata
7  Alasmidonta marginata  5  Obovaria subrotunda
1  Amblea plicata  8  Quadrula cylindrica
2  Anodonta grandis grandis  Q. pustulosa
15  Anodontoides ferussacianus  Q. quadrula
4  Cyclonaias tuberculata  1  Strophitus undulatus
28  Fusconaia flava  7  Tritogonia verrucosa
Lampsilis fasciola
28  L. ovata ventricosa  2  Villoosa iris
19  L. radiata siliquoidea  V. lienosa
13  Lasmigona complanata  L. compressa

SUBSTRATE: ESTIMATION (% BY VOL.)  SILT  SAND  GRAVEL  COBBLE  BEDROCK  OTHER
TRANSECTS (% BY WEIGHT)
CLAY 5.5  SILT 4.3  FINE SAND 1.2  MEDIUM SAND 15.6  COARSE SAND 11. GRAVEL 61.0

WATER QUALITY:  TEMP °C  12.0  HARDNESS mg/l  356  NO₂-NO₃ mg/l .57
DO  12.6  AMMONIA mg/l  .18  NITRITE mg/l .01
pH  8.414  PHOSPHATE mg/l  .03  NITRATE mg/l .56

PHYSICAL DATA:  WIDTH max  15 m  LAND USE  agricultural
DEPTH max  3 m
FLOW  2 m/sec

REMARKS:  

MAP
SITE # 25  STATE IL  COUNTY Vermilion  STREAM North Fork

LOCATION  3-1/2 mi SW of Alvin  T21N, R12W, NE 1/4, Sec 24

MUSSEL COLLECTION: DATE  24 July 1980  METHOD hand  MAN-HOURS  3

Actinonaias carinata carinata  6  Lasmigona costata
6  Alasmidonta marginata  Obovaria subrotunda
Amblema plicata  Pleurobema cordatum
1  Anodonta grandis grandis  Quadrula cylindrica
2  Anodontoides ferussacianus  Q. pustulosa
18  Cyclonaias tuberculata  Q. quadrula
5  Fusconaia flava  Strophitus undulatus
2  Lampsilis fasciola  Tritogonia verrucosa
17  L. ovata ventricosa  V. lienosa
15  L. radiata siliquoidea  V. liliosa
4  Lasmigona complanata
13  L. compressa

SUBSTRATE: ESTIMATION (% BY VOL.)  SILT 10  SAND 50  GRAVEL 40  COBBLE  BEDROCK  OTHER

TRANSECTS (% BY WEIGHT)
CLAY 5.8  SILT 3.2  FINE SAND 1.0  MEDIUM SAND 25.2  COARSE SAND 17.2  GRAVEL 46.9

WATER QUALITY: TEMP °C  11.2  HARDNESS mg/1  299  NO₂⁻⁻NO₃⁻ mg/1  .29
DO  11.0  AMMONIA mg/1  .24  NITRITE mg/1  .01
pH  8.185  PHOSPHATE mg/1  1.03  NITRATE mg/1  .28

PHYSICAL DATA: WIDTH max  20 m
DEPTH max  .6 m
FLOW  .1 m/sec
LAND USE  agricultural

REMARKS:  good bed below bridge

MAP
SITE # 26  STATE  IL  COUNTY  Vermilion  STREAM  North Fork

LOCATION 6-1/2 mi N of Danville at IL 1 br.  T20N, R11W, NW 1/4, Sec 8

MUSSEL COLLECTION: DATE 30 Sept 1980  METHOD  hand  MAN-HOURS  3

Actinonaias carinata  carinata
Alasmidonta marginata
Amblema plicata
1 Anodonta grandis grandis
Anodontoides ferussacianus
2 Cyclonaias tuberculata
11 Fusconaia flava
16 Lampsilis fasciola
8 L. ovata ventricosa
12 L. radiata siliquioidea
3 Lasmigona complanata
2 L. compressa

1 Lasmiogona costata
2 Obovaria subrotunda
2 Pleurobema cordatum
3 Quadrula cylindrica
3 Q. pustulosa
3 Q. quadrula
3 Strophitus undulatus
3 Tritogonia verrucosa
3 V. lienosa

SUBSTRATE: ESTIMATION (% BY VOL.)  SILT 10  SAND 50  GRAVEL 40  COBBLE  BEDROCK  OTHER

TRANSECTS (% BY WEIGHT)
CLAY 5.2  SILT 5.1  FINE SAND 1.1  MEDIUM SAND 25.4  COARSE SAND 25.8  GRAVEL 39.3

WATER QUALITY: TEMP °C  11.5  HARDNESS mg/l  295  NO₂⁻NO₃ mg/l  .29
DO  11.0  AMMONIA mg/l  .12  NITRITE mg/l  .01
pH  8.237  PHOSPHATE mg/l  1.02  NITRATE mg/l  .28

PHYSICAL DATA: WIDTH max  19 m
DEPTH max  8 m
FLOW  .1 m/sec
LAND USE  agricultural

REMARKS: most clams in roots of trees in silt-sand mixture

MAP

wooded

wooded

substrate transects
SITE # 27  STATE IL  COUNTY Vermillion  STREAM North Fork

LOCATION In w Danville at Harrison Park  T20N,R12W,SE 1/4,Sec 36 & T20N,R11W,SW 1/4, Sec 31

MUSSEL COLLECTION: DATE 30 Sept 1980  METHOD hand  MAN-HOURS 3

1 Actinonaias carinata carinata
_1 Alasmidonta marginata
_1 Amblema plicata
_3 Anodonta grandis grandis
_3 Anodontaferussacianus
_3 Cyclonaias tuberculata
_1 Fusconaia flava
_1 Lampsilis fasciola
_1 L. ovata ventricosa
_1 L. radiata siliquoidea
_1 Lasmigona complanata
_1 L. compressa

Lasmigona costata
Obovaria subrotunda
Pleurobema cordatum
Quadrula cylindrica
O. pustulosa
O. quadrula
Strophitus undulatus
Tritogonia verrucosa
Villosa iris
V. lienosa

SUBSTRATE: ESTIMATION (% BY VOL.)
SILT 10  SAND 25  GRAVEL 25  COBBLE 20  BEDROCK 20  OTHER

TRANSECTS (% BY WEIGHT)
CLAY 8.2  SILT 12.0  FINE SAND 2.1  MEDIUM SAND 8.6  COARSE SAND 0.8  GRAVEL 65.2

WATER QUALITY:
TEMP °C 10.2  HARDNESS mg/1 241  NO₃-NO₂ mg/1 .08
DO 12.0  AMMONIA mg/1 .12  NITRITE mg/1 .01
pH 8.665  PHOSPHATE mg/1 .01  NITRATE mg/1 .07

PHYSICAL DATA:
WIDTH max 19 m (streambed maximum width is 23 m)
DEPTH max .6 m
FLOW .1 m/sec
LAND USE recreational

REMARKS: water turbid, lots of dead Corbicula, bottom composed of much rock
and cobble which made it hard to sample by hand, live Corbicula also

MAP
SITE # 28  STATE IL  COUNTY Vermilion  STREAM Vermilion River

LOCATION 3 mi E of Tilton  T19N,R11W,NW 1/4, Sec 27

MUSSEL COLLECTION: DATE 30 Sept 1980  METHOD hand  MAN-HOURS 3

Actinonaias carinata carinata
Alasmidonta marginata
Ambela plicata
Anodonta grandis grandis
Anodontoides ferussacianus
Cyclonaias tuberculata
Fusconaia flava
Lampsilis fasciola
L. ovata ventricosa
L. radiata siliquoidea
Lasmigona complanata
L. compressa
Lasmigona costata
Obovaria subrotunda
Pleurobema cordatum
Quadrula cylindrica
Q. pustulosa
Q. quadrula
Strophitus undulatus
Trisogonia verrucosa
Villosa iris
V. lienosa

SUBSTRATE: ESTIMATION (% BY VOL.) Silt 20 Sand 60 Gravel 20 Cobble Bedrock Other

TRANSECTS (% BY WEIGHT)
Clay 10.0 Gil 9.5 Fine Sand 7.3 Medium Sand 35.0 Coarse Sand 5.8 Gravel 31.6

WATER QUALITY: TEMP °C 10.5
DO 11.4
pH 8.009
HARDNESS mg/l 241
AMMONIA mg/l 1.94
PHOSPHATE mg/l 12.0
NITRATE mg/l 3.28
NO₂⁻NO₃ mg/l 3.61
NITRITE mg/l .33

PHYSICAL DATA: WIDTH max 36 m
DEPTH max 6 m
FLOW 0 m/sec
LAND USE agricultural

REMARKS: silt layer over all of streambed, some dead shells

MAP
SITE # 29  STATE IL  COUNTY Vermilion  STREAM Vermillion River
LOCATION 4-1/2 mi E of Westville  T18N,R11W,SW 1/4, Sec 12

MUSSELCOLLECTION: DATE 30 Sept 1980  METHOD hand  MAN-HOURS 3

<table>
<thead>
<tr>
<th>Species</th>
<th>Alive</th>
<th>Collection Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Actinonaias carinata</td>
<td>carinata</td>
<td>Lasmigona costata</td>
</tr>
<tr>
<td>Alasmidonta marginata</td>
<td></td>
<td>Obovaria subrotunda</td>
</tr>
<tr>
<td>Amblema plicata</td>
<td></td>
<td>Pleurobema cordatum</td>
</tr>
<tr>
<td>Anodontaprinsis grandis</td>
<td></td>
<td>Quadrula cylindrica</td>
</tr>
<tr>
<td>Anodontoides ferussacianus</td>
<td></td>
<td>Q. pustulosa</td>
</tr>
<tr>
<td>Cyclonaias tuberculata</td>
<td></td>
<td>Q. quadra</td>
</tr>
<tr>
<td>Fusconaia flava</td>
<td></td>
<td>Strophitus undulatus</td>
</tr>
<tr>
<td>Lampisilis fasciola</td>
<td></td>
<td>Trigonia verrucosa</td>
</tr>
<tr>
<td>L. ovata ventricosa</td>
<td></td>
<td>Villosa iris</td>
</tr>
<tr>
<td>L. radiata siliquoidea</td>
<td></td>
<td>V. lienosa</td>
</tr>
<tr>
<td>Lasmigona complanata</td>
<td></td>
<td></td>
</tr>
<tr>
<td>L. compressa</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

no live clams

SUBSTRATE: ESTIMATION (% BY VOL.) SILT 10  SAND 60  GRAVEL 30  COBBLE 60  BEDROCK 10  OTHER 10

TRANSECTS (% BY WEIGHT)
CLAY 6.9  SILT 21.6  FINE SAND 2.0  MEDIUM SAND 25.5  COARSE SAND 19.5  GRAVEL 35.0

WATER QUALITY: TEMPERATURE °C 9.5  HARDNESS mg/1 356  NO2-NO3 mg/1 5.08
DO 12.8  AMMONIA mg/1 1.36  NITRITE mg/1 .36
pH 7.844  PHOSPHATE mg/1 1.8  NITRATE mg/1 4.72

PHYSICAL DATA: WIDTH max 45 m
DEPTH max 5 m
FLOW 0 m/sec
LAND USE agricultural

REMARKS: live Corbicula

MAP

(old road)
Appendix II. Site localities for 1980 mussel collections on the Vermilion River System.

1. IL: Champaign Co., Salt Fork. T20N, R9E, SE1/4, Sec. 31 +/- SW1/4, Sec. 32. In N. Urbana at Lincoln Ave. br.


3. IL: Champaign Co., Salt Fork. T19N, R10E, SW1/4, Sec. 5. 3-1/2 mi NE of St. Joseph.


5. IL: Champaign Co., Salt Fork. T18N, R10E, NW1/4, Sec. 33. 2 mi N of Sidney.

6. IL: Champaign Co., Salt Fork. T18N, R10E, W1/2, Sec. 10. 1 mi NE of Sidney.

7. IL: Champaign Co., Salt Fork. T18N, R10E, NE1/4, Sec. 1 & T18N, R11E, NW1/4, Sec. 6. 3 mi NW of Homer.

8. IL: Champaign Co., Salt Fork. T18N, R14W, NW1/4, Sec. 6. 2 mi NW of Homer.

9. IL: Champaign Co., Salt Fork. T19N, R14W, SW1/4, Sec. 33. 1-1/2 mi N of Homer at IL 49 br.


14. IL: Ford Co., Middle Fork. T23N, R9E, SE1/4, Sec. 15. 4-1/2 mi WSW of Paxton.

15. IL: Ford Co., Middle Fork. T23N, R10E, SW1/4, Sec. 34. 4-1/2 mi SE of Paxton.

16. IL: Champaign Co., Middle Fork. T22N, R14W, SW1/4, Sec. 5. 9 mi SE of Paxton.
Appendix II. Site localities for 1980 mussel collections on the Vermilion River System. (continued)

17. IL: Vermilion Co., Middle Fork. T21N, R14W, SE1/4, Sec. 2. 5 mi W of Potomac.

18. IL: Vermilion Co., Middle Fork. T21N, R13W, NE1/4, Sec. 15. 1-1/2 mi S of Potomac.

19. IL: Vermilion Co., Middle Fork. T20N, R12W, NE1/4, SW1/4, Sec. 8. 7-1/2 mi S of Potomac.

20. IL: Vermilion Co., Middle Fork. T19N, R12W, NE1/4, Sec. 16. 2-1/2 mi N of Catlin at jct. with Salt Fork.


22. IL: Vermilion Co., North Fork. T23N, R12W, NW1/4, Sec. 35. 2-1/2 mi N of Rossville.

23. IL: Vermilion Co., North Fork. T22N, R12W, NE1/4, Sec. 23. 2 mi SW of Rossville.


25. IL: Vermilion Co., North Fork. T21N, R12W, NE1/4, Sec. 24. 3-1/2 mi SW of Alvin.

26. IL: Vermilion Co., North Fork. T20N, R16W, NW1/4, Sec. 8. 6-1/2 mi N of Danville at IL 1 br.


28. IL: Vermilion Co., Vermilion River. T19N, R11W, NW1/4, Sec. 27. 3 mi E of Tilton.

29. IL: Vermilion Co., Vermilion River. T18N, R11W, SW1/4, Sec. 12. 4-1/2 mi E of Westville.
Appendix III. Core sampler used for substrate sampling in November 1980 on the Vermilion River system.
Appendix IV. Some of the sites collected in 1980-1981 on the Salt, Middle and North Forks and the Vermilion River proper.
Sites on the Salt Fork

Site 1

Site 2

Site 10

Site 13
Sites on the Middle Fork
Sites on the North Fork
Sites on the Vermilion River

Site 28

Site 29